MOTOR AGE

Vol. XXIX
No. 15

CHICAGO, APRIL 13, 1916

Ten cents a copy
Three dollars a year

Maxwell

Essentials

THE claims made for motor cars are varied and many. You have been told of the speed of one engine; you have read reams of oratory on the great power of another engine; you have observed the stress laid on the virtues of multi-cylinder construction; elsewhere you have been confronted with a wide sweeping array of superlatives carefully substituted for concrete and pertinent facts.

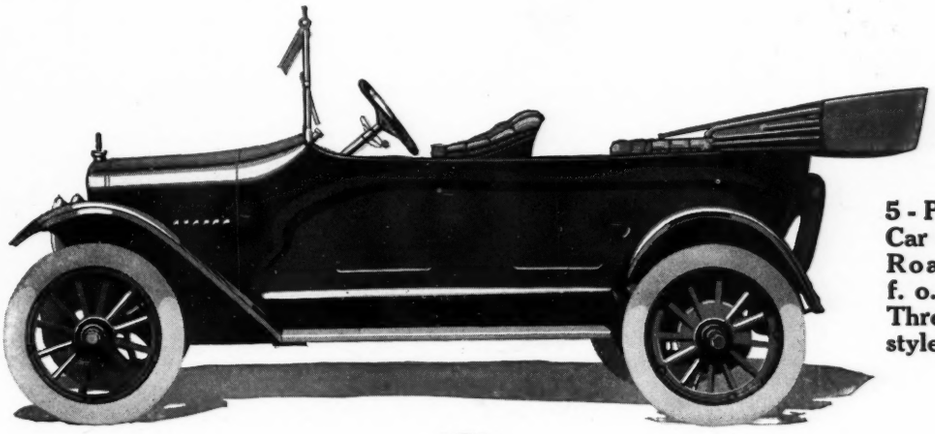
To make a thoughtful and intelligent selection, it is necessary to sift the essentials from the non-essentials, because there are a lot of things said that are not important, even if true.

Deciding on a motor car for your particular needs is just the same as making any other kind of a decision. You must disregard the unimportant elements and weigh the remaining facts against your individual requirements.

If you are interested in a car that is inexpensive in first cost and after cost, you will want to investigate the Maxwell. If you attach importance to sturdiness and reliability, you should know that the Maxwell is the World's Champion Endurance Car—it having traveled 22,000 miles last January without repairs, readjustments or without a single motor stop.

If you are concerned with gasolnie and tire mileage, you will recall that on this 22,000-mile endurance run the Maxwell stock touring car averaged almost 22 miles to the gallon and over 9,000 miles per tire.

In the end you must be the judge, but just remember that there must be a definite reason for a production approaching 80,000 Maxwell cars during the present year.



5 - Pass. Touring Car $655; 2-Pass. Roadster $635 f. o. b. Detroit. Three other body styles.

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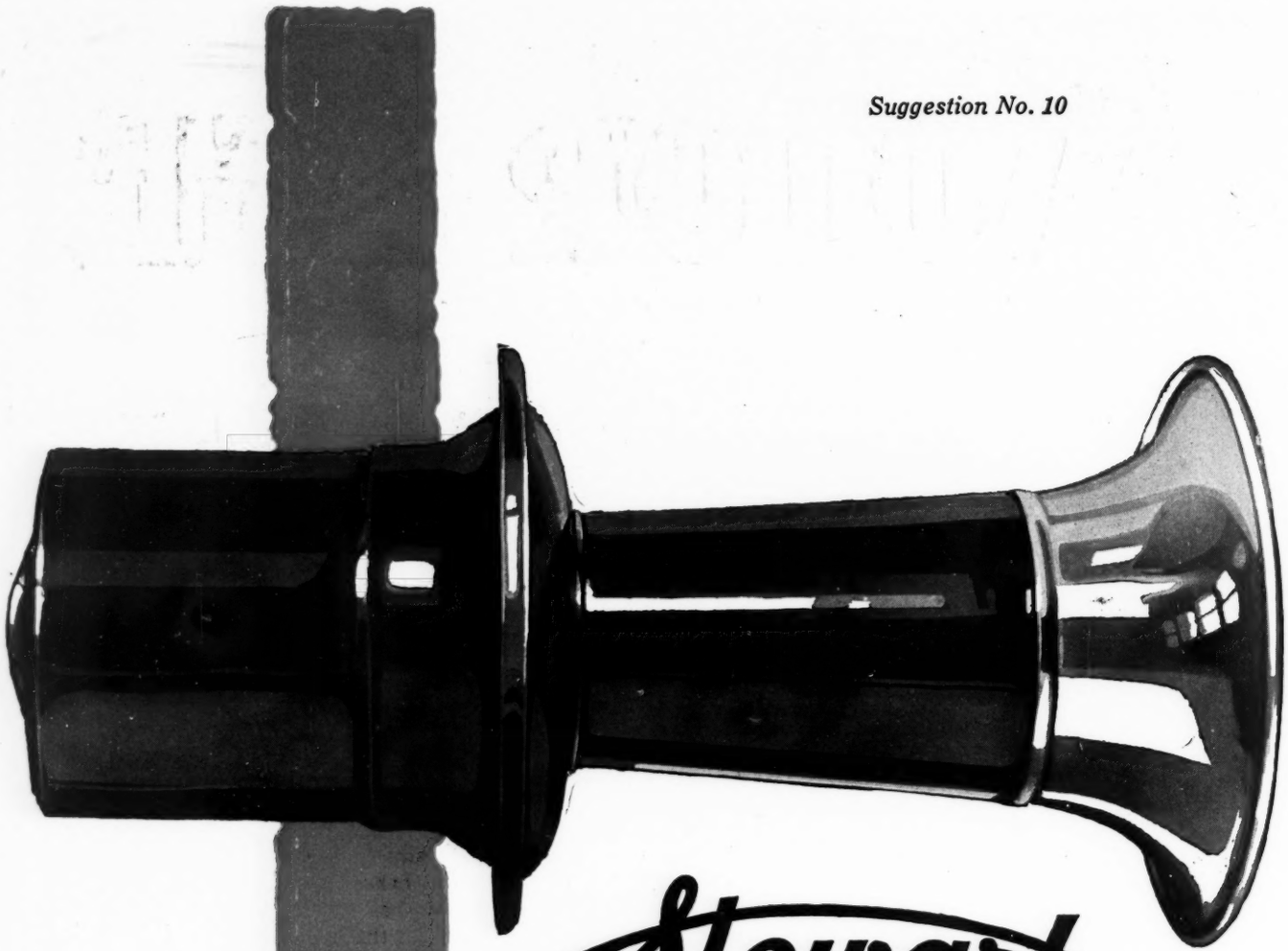
MOTOR COMPANY, DETROIT, MICHIGAN

Suggestion No. 10



Stewart Warning Signal

Motor Driven

$6

No other signal sounds like it—

No other signal looks like it—

No other signal wears like it—

No other signal warns like it—

No other signal sells like it—

"No car is better than its accessories"

The Stewart-Warner Speedometer Corporation
Chicago, Illinois, U. S. A.

MOTOR AGE

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ANNOUNCEMENTS

"City Ordinances from Behind the Steering Wheel," a feature of lively interest to motorists visiting cities other than their own, will be the leading article in the next issue of Motor Age, April 20. It is puzzling enough to know which streets to travel without the petty annoyances that results if one is unaccustomed to the traffic regulations of the city in which one happens to be. The article is a digest of the ordinances of the principal cities.

—BOY DRIVER CONTEST—

Because Motor Age's annual touring opening number has been postponed to the issue of May 18, the time of the Boy Driver contest has been extended to May 1. Manuscripts received until that date will be eligible for the $100 in prizes.

The High Price of Gasoline Creates a Special Advertising Opportunity for Manufacturers of—

Carbureters	Aluminum Pistons
Vacuum Systems	Motors
Fuel Savers	Commercial and Touring Trailers
Piston Rings	Tire Saver Kits
Speed Controllers	Light Weight or Aluminum Bodies
Magnetos and other Ignition Devices	

And for all other products which directly or indirectly effect economies in motor car maintenance and operation, or increase the utility of motor cars as vehicles for pleasure or business.

Over 2,500,000 motor car owners are in the market for upkeep reducing equipment now. Unprecedented prosperity has put them in a wonderfully responsive buying mood.

Furthermore, motor car dealers are stocking heavier than ever in anticipation of the needs of the 1,000,000 new motorists who will join the ranks this year. Direct your message to both classes through the advertising columns of MOTOR AGE. The season is just opening. Opportunity is here!

MOTOR AGE
Mallers Building, Chicago

A STATEMENT

Concerning Final Drive in White Motor Trucks

IN VIEW of the conflicting claims for this form and that form of final drive which now confront the purchaser of heavy duty trucks, this Company, as the largest manufacturer of motor trucks in America, deems it fitting to make a public statement of its own purpose and practice in the matter.

White Trucks of over two tons capacity have always been chain-driven, and *will continue to be chain-driven* until some other form of final drive is developed in the future which is more efficient or equally efficient. In its present stage of development, worm drive will not be adopted by this Company, and White engineers now see no prospect of its basic handicaps ever being sufficiently overcome to warrant its adoption.

CHAIN DRIVE EFFICIENCY

1. White chain-driven trucks are more efficient because more power is delivered to the rear wheels.
2. They require a smaller motor for equal load capacity.
3. They consume less gasoline, getting as high as 50% more mileage per gallon.
4. They endure a higher road speed; perform more easily on rough roads, steep grades, and in heavy going.
5. They pull loads out of chuck holes and over obstructions which would stall a worm-driven truck.
6. Tire mileage is materially greater because the unsprung weight on the wheels is so much less.

WHITE TRUCK PERFORMANCE

Motor trucks have been in use long enough to accumulate a volume of motor truck experience, long enough for owners to know *actual operating value*. They can compare one truck with another. They have the records of performance; and large users who keep the most effective cost records indicate the showing of those records by an overwhelming preference for White Trucks.

That preference is well known. It is eloquently reflected in the fact that in total annual sales White Trucks predominate two to one of any other make, and among many large users they predominate ten to one.

WHITE TRUCK PREDOMINANCE

When a truck both outsells any competitor two to one and commands a higher price—its competition is severely felt by trucks of similar design, so severely in fact, as to necessitate a change in that design to escape the brunt of parallel competition. This gives rise to new theories of construction, which are adopted to arouse fresh interest rather than to improve the truck, in the endeavor to divert attention from White *performance*.

At this late stage of motor truck experience there is no need of truck buyers being bewildered by fads and theories. Over and above the conflict of all theory looms the solid fact of White Truck performance—longer life, more days in service, lower eventual cost, as attested by comparative cost records of numerous large users and by the fact that such users purchase more White Trucks every year than trucks of any other make.

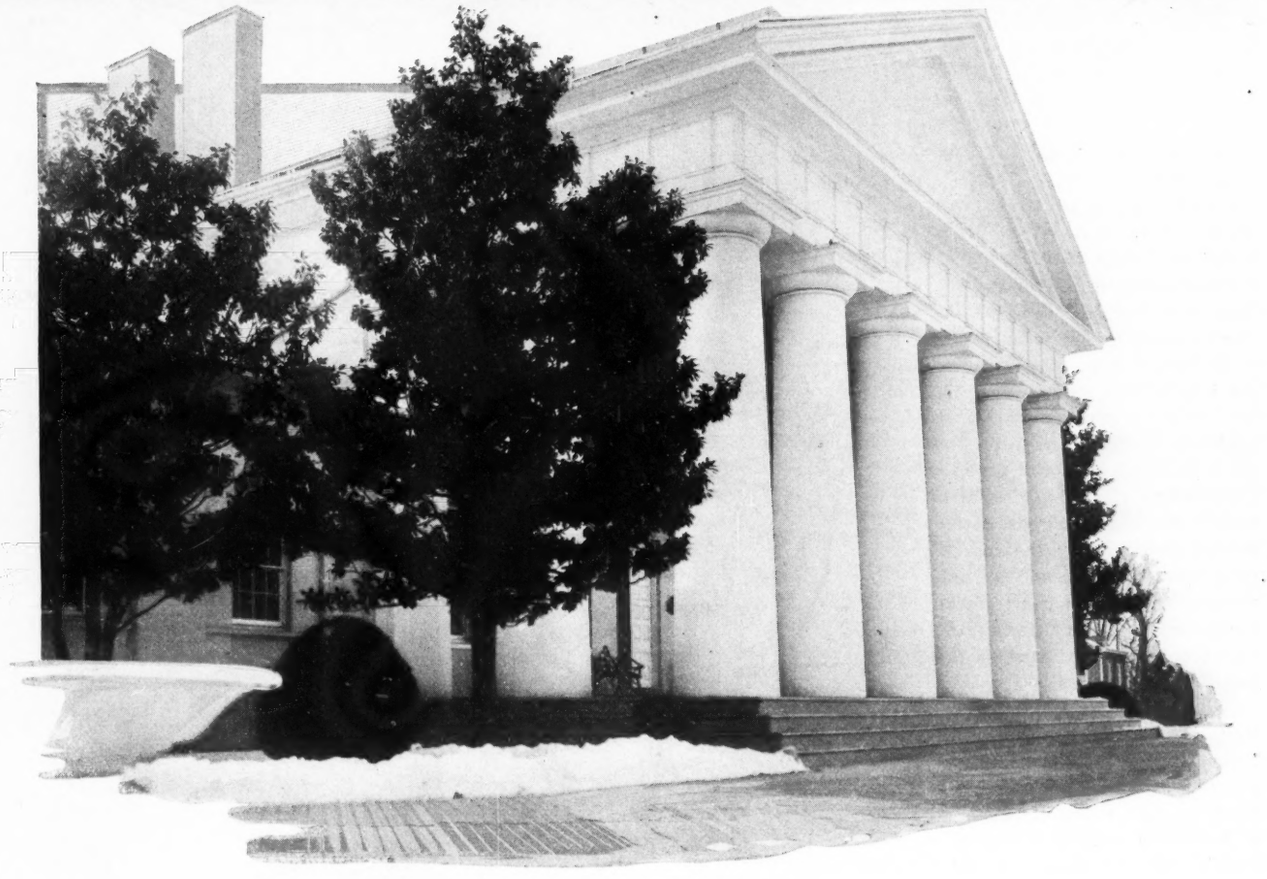
THE WHITE COMPANY

CLEVELAND

ONLY GRAND PRIZE for Motor Trucks, Panama-Pacific International Exposition, San Francisco

Vol. XXIX, No. 15 Chicago, April 13, 1916 $3.00 Per Year

MOTOR AGE



The Arlington home of General Robert E. Lee

Old National Pike Is Rejuvenated

Early Highway Rich in Historical Associations—Restoring the Washington-Baltimore-Frederick Triangle

In Two Parts—Part 1.

EDITOR'S NOTE—Recent improvements between Baltimore, Md., Washington, D. C., Cumberland, Md., and Wheeling, W. Va., have brought the Old National Pike to a high modern standard, and now emphasize its growing importance in our transcontinental highway system. Robert Bruce has been studying this national highway movement for the last 15 years and is perhaps more familiar with the route east of the Ohio river than any other person, having traversed it from end to end four times within the last year. Mr. Bruce is publishing a special book on this entitled "The National Road," which will be issued in the near future.

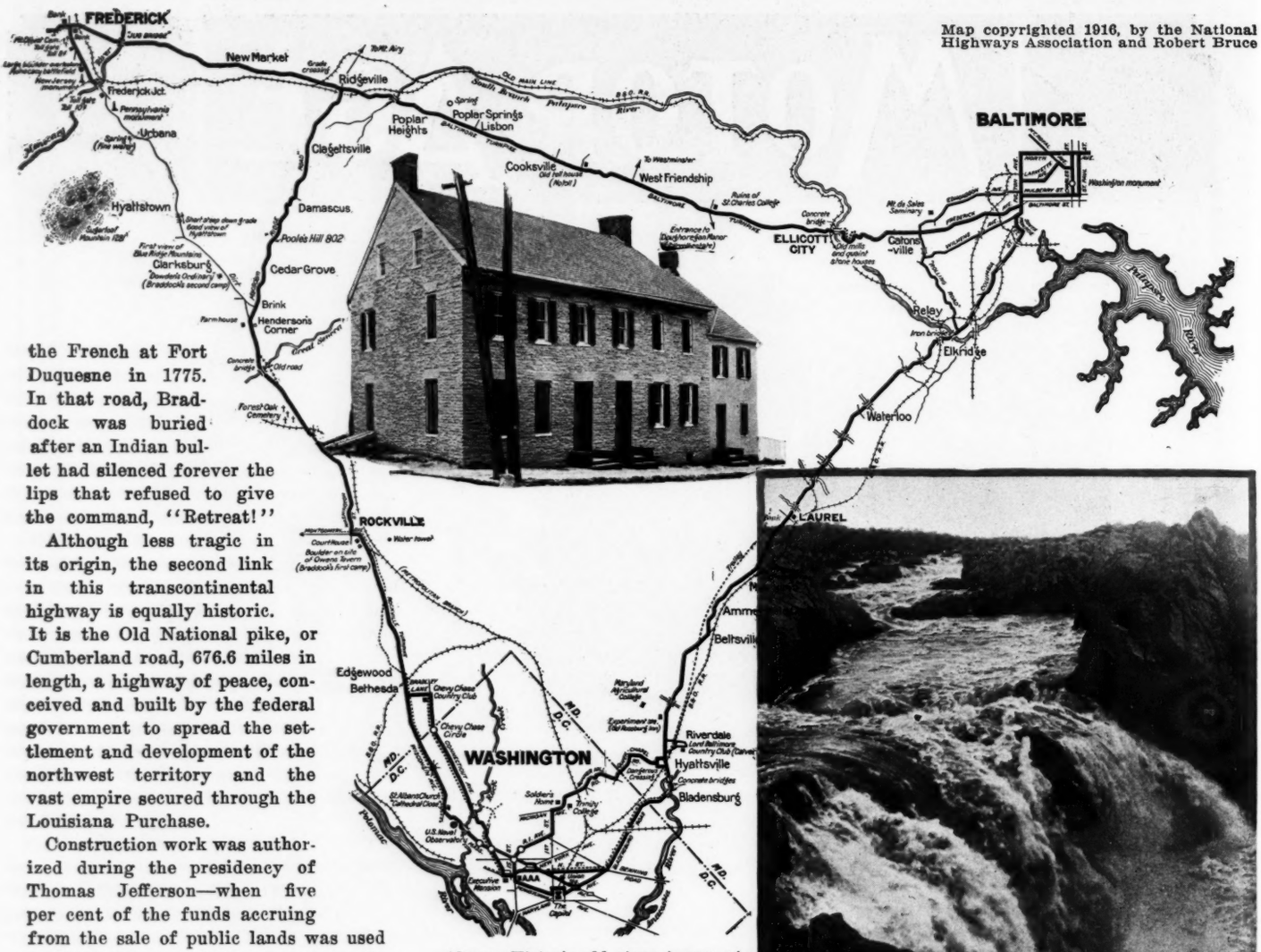
By Robert Bruce
of the Automobile Blue Book

Of the many notable road improvements that have been under way in the United States during the last 3 years, probably no single one has been crowned with more far-reaching and satisfactory results than that done on the old National pike, extending from Chesapeake bay at Baltimore, Md., and the Potomac river at Washington, D. C., across several ranges of the Alleghany mountains to the Ohio river at Wheeling, W. Va., and serving as the first two links of the five-link National Old Trails route, ending at Los Angeles.

The eastern link of this romantic highway that forms a medium of transcontinental motor travel in winter follows what was originally Braddock's road, a 135-mile thoroughfare that joins Washington and Baltimore with Uniontown, Pa., the first town west of the last Alleghany range. It is older than the republic itself, having been blazed by George Washington, then a loyal subject of King George II, in 1752, as a forest trail between the Potomac and Monongahela rivers.

Over Braddock's road the hot-tempered English commander, General Edward Braddock, marched to his death in the unsuccessful and sanguinary expedition against

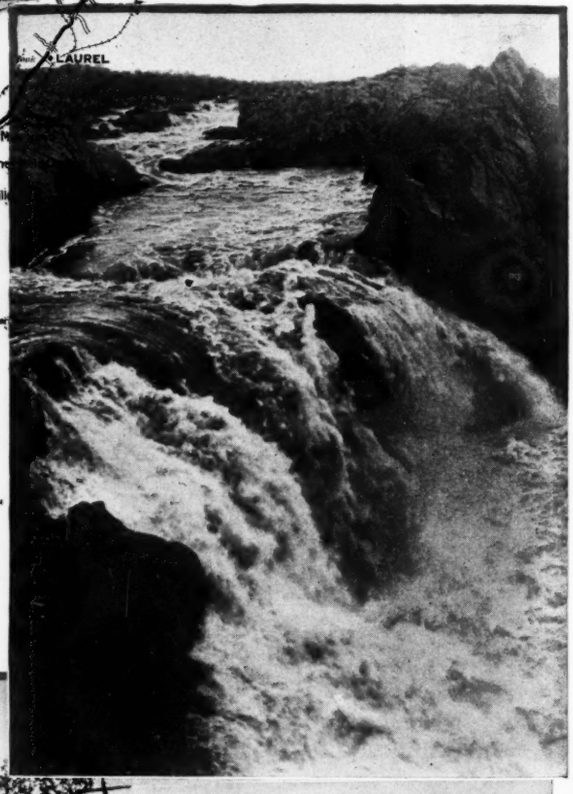
Map copyrighted 1916, by the National Highways Association and Robert Bruce



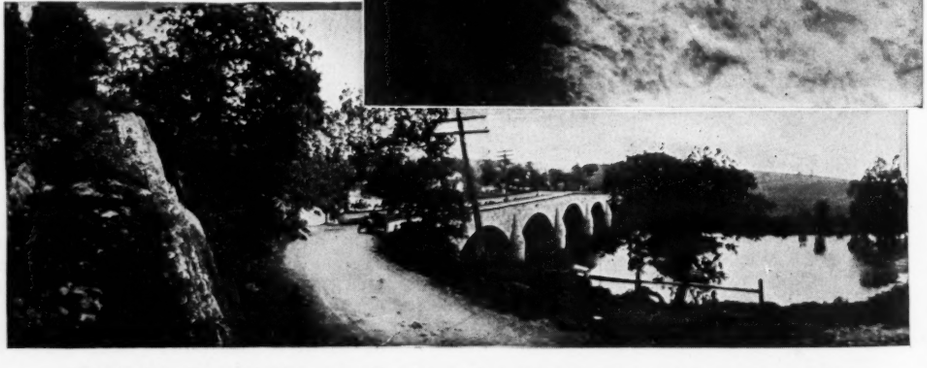
the French at Fort Duquesne in 1775. In that road, Braddock was buried after an Indian bullet had silenced forever the lips that refused to give the command, "Retreat!"

Although less tragic in its origin, the second link in this transcontinental highway is equally historic. It is the Old National pike, or Cumberland road, 676.6 miles in length, a highway of peace, conceived and built by the federal government to spread the settlement and development of the northwest territory and the vast empire secured through the Louisiana Purchase.

Construction work was authorized during the presidency of Thomas Jefferson—when five per cent of the funds accruing from the sale of public lands was used to build the road that was to have its terminus at the Mississippi river. Two hundred and seventy miles were macadamized. The government macadamized 270 miles before the project was abandoned in 1837.



Above—Historic old stone tavern at Frederick, Md. Also a useful landmark, as in front of it one turns right, towards Hagerstown; right—The falls of the Potomac river



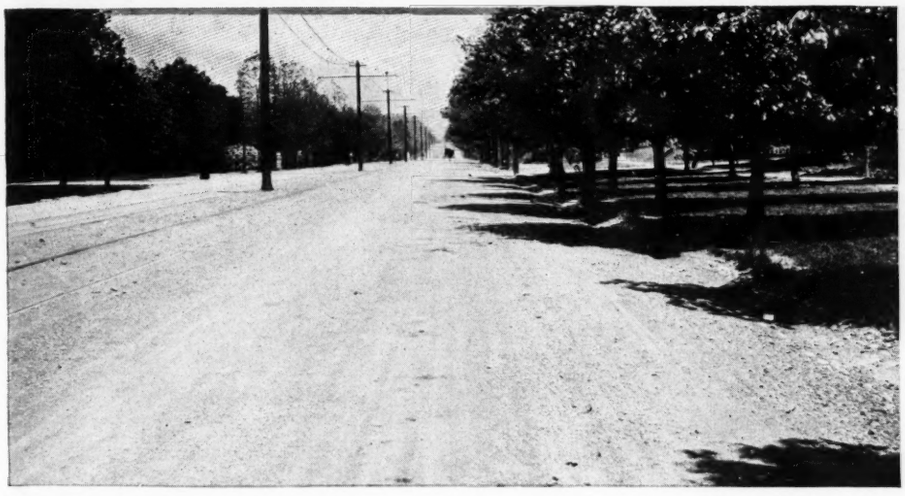
Picturesque stone bridge over Conocheaque creek just west of Hagerstown, Md.

From the standpoint of historic interest, this route not only exceeds any other of equal length in the entire country, but it occupies so strategic a location that the matter of its being in good or poor condition has been vital to thousands of middle-distance and long-distance tourists making trips from the East to the central West or beyond, south of the Philadelphia-Gettysburg-Pittsburgh pike, now the Lincoln highway. With a few exceptions so slight as to be relatively unimportant that entire route of 300 miles between the Atlantic and the Ohio will be in first-class shape for the 1916 touring season and this will create a new popular interest in the old road, its wonderful variety of topography and scenery, and especially its unique history.

Topographically this 300 miles divides itself into three broad divisions.

First is the level or rolling country from Baltimore, Md., to Frederick, Md., 45 miles. Second, across the Blue ridge and several ridges of the Alleghanies with their fertile valleys, 178 miles of the finest mountain touring in the eastern states. Third, the gradual descent on the west of the Alleghanies to the Ohio river, 67 miles.

The better to appreciate the thorough-going nature of this improvement, it should be remembered that until 3 years ago, portions of the middle section between Hagerstown, Md., and Cumberland, Md., were considered practically impassable for motor tourists. The former surface, some of it laid by the federal government before control of the pike lapsed back to the several states in 1832-34, had been largely worn off, and streams gorged by spring freshets had formed many deep gullies across the road, while in some places large rocks had rolled down from the nearby hillsides, and no attempt had been made



Glimpses near Chevy Chase on the way out of Washington, D. C., to Rockville and Frederick, by the way of the Baltimore-Washington-Frederick triangle

to take them away. Vast quantities of lumber were drawn across one stretch on narrow-tired wagons, with the result that ruts were worn several inches deep; once in them a car could hardly get out, regardless of injury to tires. So long as these conditions existed it was no uncommon thing for tourists from Washington, D. C., the Shenandoah valley and south, bound for Wheeling or beyond, to continue up through Hagerstown and Mercersburg, Pa., to Chambersburg, Pa., thence west over the Philadelphia-Pittsburgh route, crossing Cove mountain, a steeper grade than any on the direct Cumberland-Wheeling route, and coming down from Pittsburgh through Washington, Pa., to Wheeling, after traveling at least 50 per cent farther than is necessary today.

Rewards of Competition

While there have probably been no impassable stretches on the old pike in Pennsylvania since its completion to the Ohio river in 1818, there were many miles of exceedingly rough and uncomfortable motoring, and very likely there was a feeling on the part of the road authorities in both states that the route on the whole could not be fully restored to through travel and popularized among motor tourists, without the needed improvements being approximately complete through each. In some sections of Pennsylvania, also, the sentiment prevailed that the federal government would shortly embark on a great roads construction program, and that the National highway would be the first improvement taken up on such a plan. At the time of our last observation over the route, about the middle of November, 1915, the mileage of unimproved road had been greatly reduced.

Some time ago it began to dawn upon the people residing in the territory through which the National pike runs that during the period some parts of it had been so badly neglected, its two principal competitors—the New York City-New England Mohawk Valley-Great Lakes route, and the Philadelphia - Lancaster - Gettysburg-Bedford-Pittsburgh route, the Lincoln highway, had greatly advanced in relative importance. Both of these are considerably longer from their Atlantic seaboard terminals to the Ohio river—and very many central-western points, than the National pike, and they are certainly of no more scenic and historic interest; but the majority of motor tourists seek out and follow the best roads leading to their various destinations, usually with secondary regard for distance, scenery or history, though with equal road conditions throughout.

As a result, the Baltimore-Washington-Hagerstown-Cumberland - Wheeling route has not only been thoroughly restored, but it has become a greater thoroughfare than was ever dreamed of by those who laid it out, or by the two generations which traveled over it on their way to new homes beyond the Alleghany mountains. Its landmarks and points of interest have been made accessible to thousands instead of hundreds; and there is no longer any question as to its being the logical eastern section of the National Old Trails transcontinental highway. **The following summary** of road conditions and other principal features is from personal observation over every mile of it at different times within the last 16 months, in some instances as many as four times over the same sections in the course of their improvement.

Westward on National Pike

The direct route from Baltimore through Ellicott City, Lisbon, Ridgeville and Newmarket to Frederick, Maryland, the start of the historic old route from the Monument City, to the West, has been in fairly good shape for several years. Leaving Baltimore the tourist finds one of the best examples of rolling road in the United States extending for practically 45 miles.

This view is typical of almost the entire route from Baltimore or Washington to Cumberland and Wheeling. There are very few level stretches but many long, moderate upgrades and downgrades, usually as straight as the nature of a hilly to mountainous country will permit

Looking west across the famous "Jug" or "Bottle" bridge over the Monocacy river a short distance east of Frederick, Md., on the way west from Baltimore. The grade beyond is the old Pike literally rising into Frederick

Almost as soon as the western fringe of Baltimore is left behind, the Patapsco river is crossed by a new concrete bridge at Ellicott City; and on the left just beyond is the first important old landmark, Doughoregan Manor, the splendid roadside estate once belonging to Charles Carroll, of Carrollton, the last survivor among the signers of the Declaration of Independence, and still occupied by his descendants.

At West Friendship a fine piece of state macadam is seen to branch north towards Westminster and Gettysburg; and at the four-corners, Cooksville, the tourist crosses the route taken by Stuart's Confederate cavalry on one of its famous raids into Pennsylvania. Ridgeville is the point where the main route from Washington to Westminster and Gettysburg intersects this older road from Baltimore; on the right-hand corner there is the Eagle hotel, still displaying the almost extinct sign of the League of American Wheelmen. Nearing Frederick the pike crosses the picturesque and historic Jug bridge into the main street of that small city.

The Washington Option

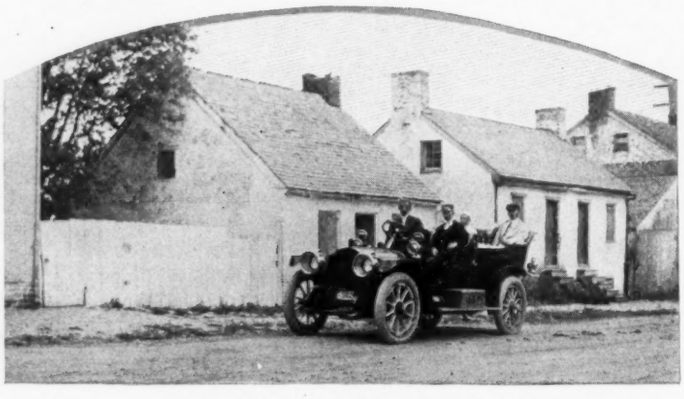
Owing to the desire of many tourists, especially visitors from distant sections, to include Washington in their trips between the East and the West over the National pike, increasing use has been made within the past year or so of the Baltimore - Washington-Frederick triangle, which leads from Baltimore through Elkridge and Laurel to Washington, 44 miles, thence northwest out of that city by either Connecticut avenue or Wisconsin avenue into and along the Rockville pike to a connection with the Baltimore-Frederick direct route at Ridgeville. This enables one to place Washington on the itinerary with only about 85 miles of additional travel; and is a most interesting alternate to the short trip through Ellicott City. The old historic route from the Potomac river to Frederick did not turn north from above Rockville to Ridgeville, but used the shorter way practically due northwest from Rockville, through Clarksburg and Hyattstown, crossing the Monocacy river in the vicinity of the Monocacy battlefield.

One Stretch Neglected

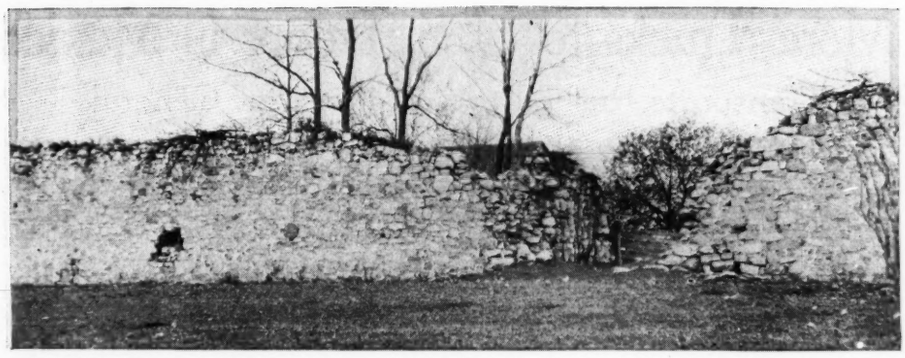
For some reason Maryland has not yet improved the last 10 or 12 miles of that old route, upon which also three toll-gates still remain; so the average tourist prefers to make the considerable detour around by Ridgeville rather than to follow the old way throughout in its present condition. However, there is nothing on it worse than several miles of rough going and one rather steep descent, apt to be slippery in wet weather, in case it is desired to run through the Monocacy battlefield and pass Mt. Olivet cemetery, where the grave of Francis Scott Key is marked by an imposing monument, thus coming into Frederick from the south instead of from the east.

This one stretch excepted, and that reduced to a relatively unimportant option, there is not today a full mile of poor surface from Baltimore to Frederick direct, or through Laurel, Washington, Rockville and Ridgeville. It is all old and historic country, and it would not be difficult for the leisurely traveler to find throughout this section many landmarks dating back to the early days when Maryland was a loyal supporter of the British crown. In fact so full of interest is this trip that many tourists bound north or south instead of east or west, go around the Baltimore-Washington-Frederick triangle, as a day's detour from their through schedule.

One advantage of this is that the route out of Washington to Rockville leads through the finest residential district of the national capital, which is entirely missed in following the usual direct ways from Baltimore or points north through Washington and across the Potomac into Virginia. Scenically and topographically, the least interesting part of the triangle is the Baltimore-Washington stretch, which is practically level, whereas its other two sides are in the rolling hill country with many excellent views, especially on the last few miles into Frederick from either Baltimore or



Passing through historic Frederick



Snapshot of Old Fort Frederick, the best preserved of all the Colonial forts in the United States. Situated within a few yards of the Chesapeake and Ohio canal and the Potomac river, about 5 minutes' ride from the National Pike at Indian Spring, on the way from Hancock to Cumberland, Md., and easy of access to motoring parties

Washington. The intersection of East Patrick and West Patrick streets with North Market and South Market streets is the meeting point of the two routes.

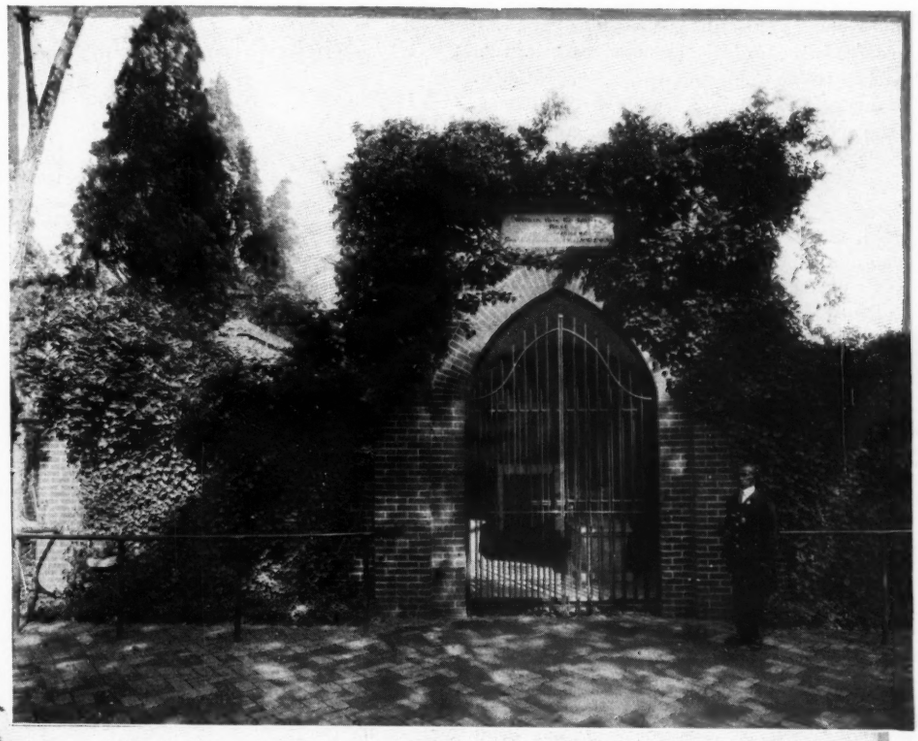
Back on National Pike

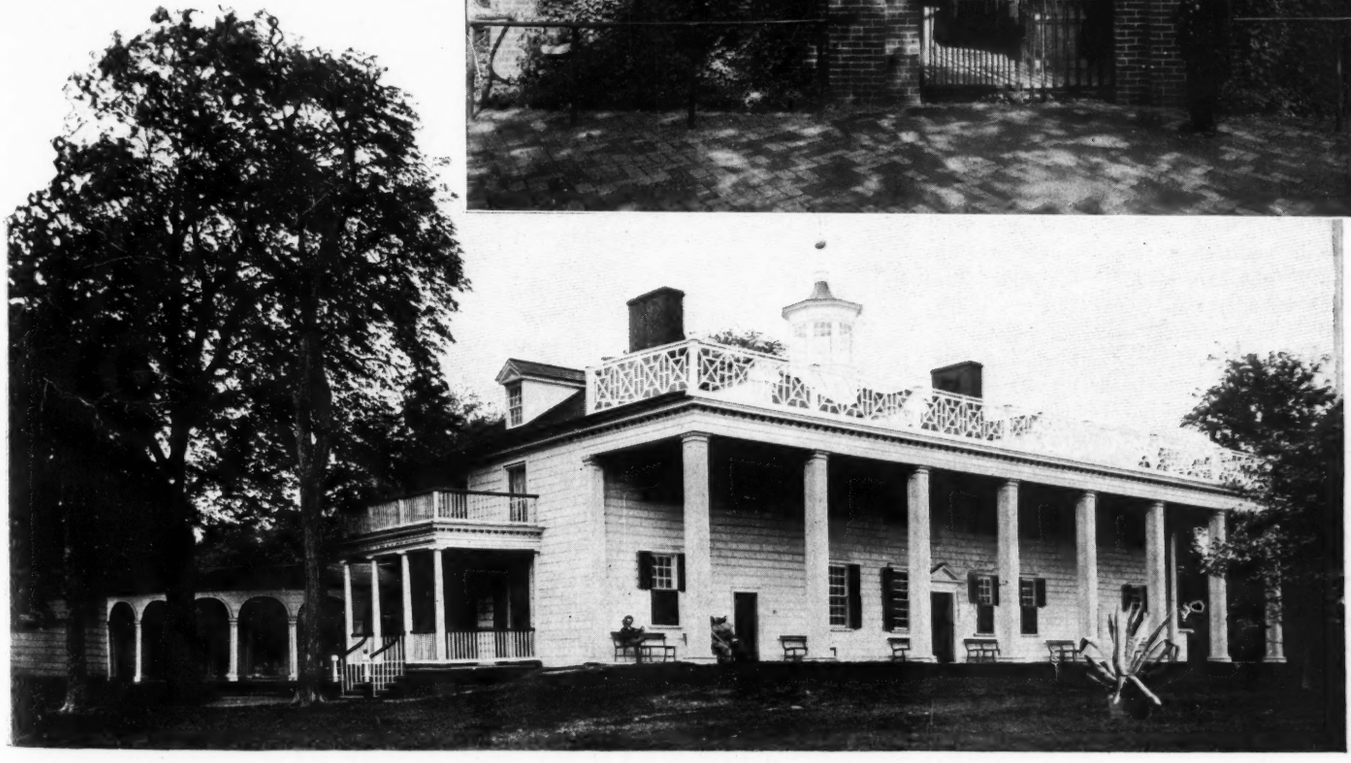
At Frederick we are again back on the main pike, having completed the Washington option. From Frederick an excellent stretch leads through a rolling highland country toward Catoctin mountain, the first range of the Blue ridge, which is crossed at Braddock heights. Next is South mountain, where the battle of that name was fought on September 14, 1862, and the way across which is made comparatively easy by the natural pass through Turner's gap. On the right-hand side, just beyond the summit in the gap, are six tablets giving in clear metal type on iron background, a good general idea of the movements of both the federal and confederate armies across this section during the civil war.

It will well repay the tourist to stop at least long enough to carefully read these tablets, and thus make a brief study of history in the very locality where some of it was made. There are splendid views in all directions, an advance indication of wilder country and steeper summits farther along. The old highway continues as direct as the nature of the country will permit through Boonsboro and across the winding Antietam at Funkstown into Hagerstown, which is about 75 miles from either Baltimore or Washington, a very comfortable half day's trip, with plenty of time for sight-seeing en route. Roads are good all the way; and except for Catoctin mountain and South mountain, it may be described as rolling.

Hagerstown is one of the most important route centers of its size in the United States, great trunk-line highways extending in practically every direction. In addition to this old road between Baltimore and Cumberland there are two complete

(Continued on page 32)





Above is the tomb of George Washington and below, Mount Vernon, his home

Special Trains Bear More Trucks to U. S. Troops in Mexico

Four Squadrons of 1½-Ton Transports Rushed to Assistance of General Funston from Packard, White and Jeffery Factories

CHICAGO, April 8—Within one week of the time that General Funston sent a call to the war department for two more trains of motor trucks, bids had been received at New York, the orders placed, not for two unit divisions but for four, and the trucks loaded and shipped to El Paso, Texas.

In all, 108 trucks of 1½-ton capacity each, two repair trucks, nine tank trucks equipped with 600-gallon tanks and four Dodge roadsters have been sent to the border from the factories in the last 4 days. Five other tank cars will go forward tomorrow, April 9, to complete contracts placed with the Four Wheel Drive Auto Co., Clintonville, Wis. This company received an order for five tank trucks early in the week and these were shipped immediately. This morning an additional order for nine tank trucks was authorized. Four of the cars were loaded and shipped immediately. Drivers are being chosen from the ranks and trained for their tasks.

All truck shipments go by special trains. The 108 trucks have come from the Packard, White and Jeffery factories. The Packard and Jeffery machines are delivered to the Rock Island railroad at Chicago and with no other delay than for switching the shipments move south at a speed exceeding the regular passenger schedule. The truck specials are given the right of way. The Whites are sent through from Cleveland, O.

Facilities for Repairs

The orders were distributed as follows: White, fifty-four 1½-ton trucks; Jeffery, twenty-seven 1½-ton trucks; Packard, twenty-seven 1½-ton trucks. A train or unit truck division consists of twenty-seven machines. According to the provisional organization specified in the army regulations, each unit of this size will have in addition a repair truck, making twenty-eight cars in all. Not all of the trains in operation have their auxiliary repair truck, due to haste in organizing the trains and obtaining equipment. But in the interim since the first truck orders were placed by the government, both the Packard and White companies have equipped special trucks for this use The army department accepted one repair truck from each of these companies with the latest contracts.

The orders for the 108 machines were authorized April 5. The Packard company had the chassis of its machines aboard the special train on the evening of the following day. At 1 o'clock on the morning of April 7 the shipment reached Chicago and at 8 o'clock the Rock Island officials reported the train at Washington, Ia., a running time of 5 hours, at a speed of 37½ miles per hour, which is faster than the average running time of passenger trains.

A total of 300 new trucks that have been purchased are operating in Mexico under General Funston's command, with the addition of the four new trains. The war department owned sixty-one trucks prior to the time of the Mexican expedition—seventy-six trucks, if the fifteen machines in use in the Philippine islands are included.

Colonel Daniel McCarthy, chief quartermaster central department, U. S. A., who attended to the arrangements for shipping the trucks, has recommended that the war department hereafter include a repair truck with each train. He also has proposed that the truck manufacturers confer upon this question and try to develop a standard type of repair truck, so far as equipment is concerned.

Three big caterpillar type tractors, motor-driven, have also gone forward to Columbus, N. M. They will be used in hauling tank wagons for water and gasoline.

Test Run for 5-Ton Military Trucks

Vehicle Men to Prove Fitness of Heavy Machines

NEW YORK, April 8—The Motor Truck Club of America, through coöperation with the National Committee of Home Defense Motorists, has organized one complete company of trucks and has arranged the details of a test run.

The company has been organized along lines evolved independently by the reserve corps committee of the club, of which George H. Pride, a haulage contractor; Roderick Stephens, a coal merchant and Arthur J. Slade, an engineer, are the members. Starting with the United States army regulations which require twenty-seven 1½-ton trucks, the committee decided that in order to demonstrate the fallacy of the popular opinion that heavy trucks were unsuited to military use, a company of 5-ton trucks would be used. The number of these required, it was thought, would not be as many as of the smaller ones, for in order to harmonize with the operating scheme for the army's standard horse-drawn escort trains, the load capacity should be about 40 tons for each unit of truck corps. Eight 5-ton trucks supply a total capacity of this much.

Accordingly, the two truck owners on the committee volunteered to make up the entire fleet from their own vehicles. Ten 6½-ton Saurer trucks have been appropriated, five from the fleet of each of these men. Eight of these are to be transport trucks and two auxiliaries—a supply truck and an emergency truck.

The preliminary maneuver will be a run from Stephens' coal yard, at One Hundred Thirty-eighth street and Mott Haven canal, New York City, to the drill grounds of Squadron A. The trucks will leave the starting point at approximately 2 o'clock and will reach the drill grounds that evening, where a camp will be pitched for the night. The next day will be spent in road maneuvers until the return to New York that evening.

The run is being conducted under the auspices of the Motor Truck Club, and regular army and militia officers have been invited to attend. Invitations have been forwarded to Maj. Gen. Leonard Wood, commander of the department of the East of the United States army, and Maj. Gen. O'Ryan, commander of the National Guard of New York, either to attend in person or to send authorized representatives. Major Wright of Squadron A cavalry, N. G. N. Y., has agreed to supply eight guardsmen to accompany the trucks and assist in camp arrangements and to supply tents, bedding and other supplies. Capt. Lorillard Spencer, adjutant general of New York, has made arrangements by which six motor cycles and riders will be supplied for the run.

The complete company will comprise the following:

MEN

First lieutenant, Arthur J. Slade, commander of train
One trumpeter
One second sergeant, driver
Two second lieutenants, R. Stephens and G. H. Pride
Two second sergeants, driver
One quartermaster sergeant
One second sergeant, driver
One third sergeant, assistant driver
One cook
One helper
One first sergeant, mechanic
One second sergeant, driver
One mechanic
One helper
Eight second sergeants, truck drivers
Eight third sergeants, assistant drivers
One advance scout, orderly
One follow up, orderly
Four signal men, orderlies attached to officers

MACHINES

One Packard touring car for first lieutenant
Two Hupmobile touring cars for second lieutenants
One 6½-ton Saurer, emergency truck
One 6½-ton Saurer, supply truck
Eight 6½-ton Saurers, transport trucks
Six motor cycles for orderlies

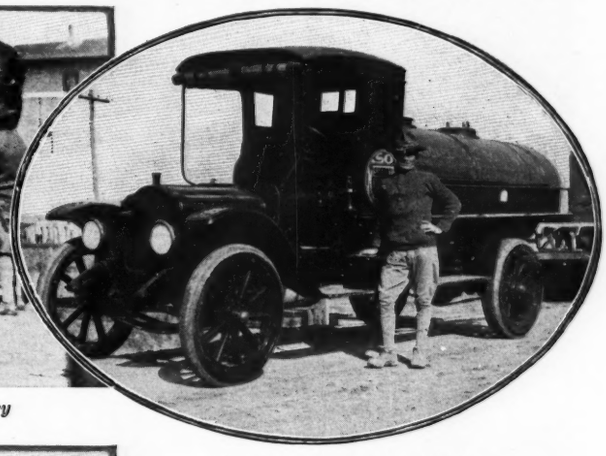
ADDITIONAL UNITS

In addition to the regular train as above constituted, there will be a photographer's car and an observer's car. The former will be a Dorris touring car and the latter a Locomobile touring car. The photographer's car will be in charge of Joseph Husson and the observer's car under the command of M. C. Horine.

The plans were first laid at a meeting of the committee held March 3, but until

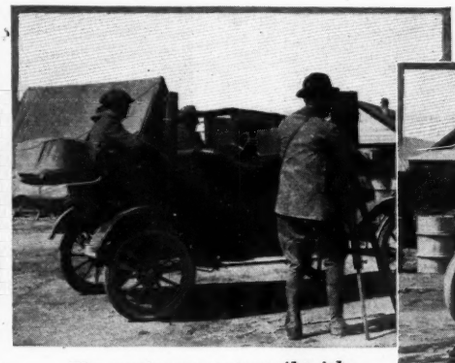
Motor Cars and Trucks Figure in Mexican Expedition

Civilians at Columbus, N. M., watching departure of the gasoline cavalry



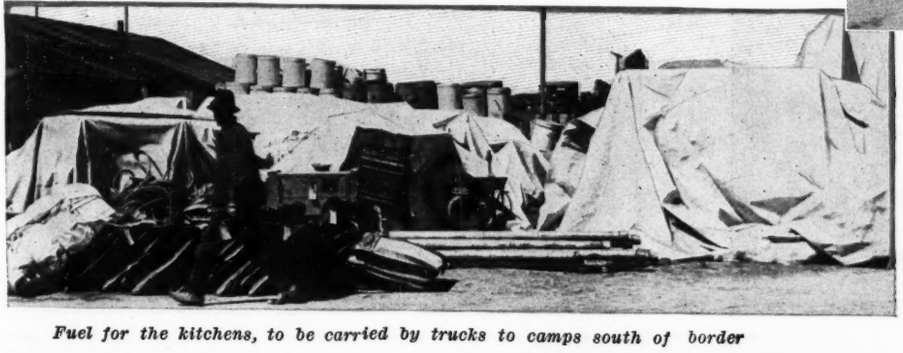
One of the new White tank trucks

Posing for the Motor Age photographer

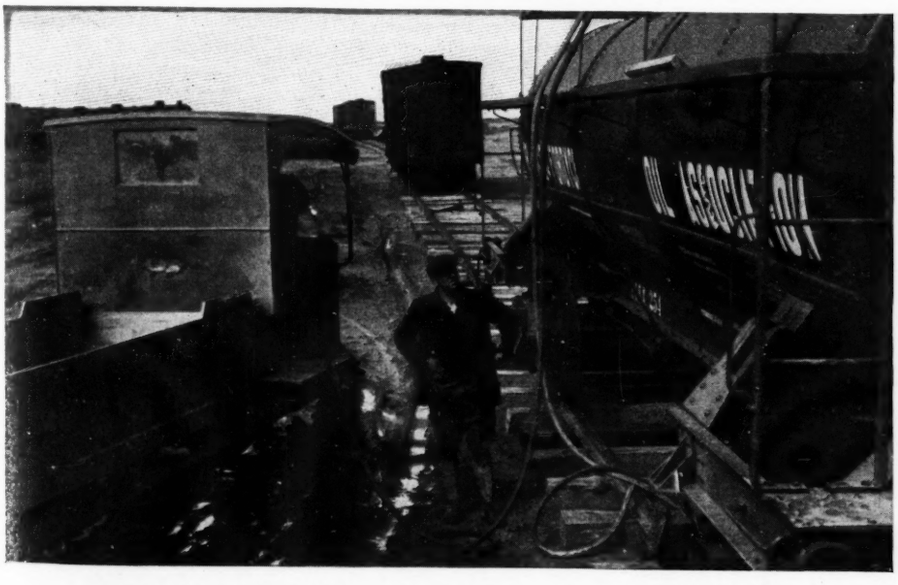


The movie men are on the job

Ford ambulance with capacity of two stretchers. This car draws a trailer also carrying two stretchers



Fuel for the kitchens, to be carried by trucks to camps south of border



A new quad taking its first supply of gasoline direct from tank car

all arrangements had been made, it was deemed advisable to say nothing about it. President Stephens of the Motor Truck Club, secretary of the committee states as follows relative to the organization:

"The first consideration of the committee, was to determine the scope of its efforts, and for that purpose it set itself to the problems of defining the needs of the army as to Automobile Reserve Corps organizations.

"It was determined that the committee would, as far as possible, collect from all possible sources, information relative to the most effective use of motor trucks in connection with army requirements, and the need of the army in that direction.

Practical Purpose of Test

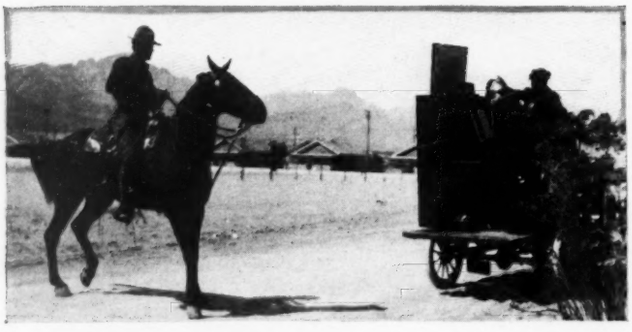
"The committee realized that in endeavoring to solve such a tremendous problem, it was simply bringing to bear upon the situation, the viewpoint of the user of motor trucks, whose experience is purely commercial, though not without value in the consideration of the issues involved.

"It was felt that would be worth while to bring this viewpoint to bear upon the problem, even though many more eminent authorities on military matters were already giving the matter their consideration.

"The second problem discussed was the

Group of Jeffery drivers just before starting for front

A sentinel at Columbus, N. M., warming up before a bonfire



Peripatetic musicians, with piano on motor car, visit camp

Unloading mail sacks at headquarters from Ford delivery car

Shovels and axes as shown here are carried on all Jefferys

Going to the front with a load of rations, tents, and guns

Jeffery quads just off the shipping platform taking their first spin

Type of Troy trailer used for heavy loads

question of securing a logical index or registration of all motor trucks which might be available either by voluntary enlistment, or by confiscation in time of national need.

"The third problem was to discover what the obligations of a motor truck reserve company would be, and, in order to establish a basis for determining this question, it was arranged to organize a motor truck transport company of 40 tons capacity consisting of ten 6½-ton Saurer trucks, with all necessary auxiliaries, etc., to constitute a self-contained transport unit."

The passenger cars in the company are the property of Messrs. Stephens, Pride and Blackman. The motor cycles will be recruited, with their riders, from among the membership of the Harlem Motor Cycle Club. In case of wet or muddy roads it is expected that the motor cycles will not be available owing to their instability under such conditions and the danger to the riders that would result.

The same Saurer 6½-ton truck types which are to be used for transports will also be used as the supply truck and emer-

gency vehicles, in conformance with the desire of the army for uniformity of make in each company.

The run is to be conducted along military lines and no outsiders are to be taken along. It will be a business run and no liquors are to be allowed in camp. The findings of the observers will become the property of the club, excepting such observations as the army officers make, which they will be free to make such use of as they see fit. The run is scheduled for fair weather or foul, and in case the motor cycles are unable to participate, the officers will communicate with one another by moving back and forth along the line and one of the passenger cars will be called upon to do advance scout work.

It is stated that the American horses cannot subsist on the native forage, and therefore a great additional tax is placed upon the quartermaster corps in supplying hay and oats.

ARMY TRUCKS DO 8 M. P. G.

El Paso, Tex., April 8—Army chauffeurs with the United States troops in Mexico report averaging 8 miles to the gallon of gasoline with their trucks while a few report as good as 11 miles but the average seems to be below 8 miles. As a round trip now means a total mileage of around 700 miles, it requires, on the average, nearly 100 gallons of gasoline per truck for the return journey.

Gasoline is selling here at 21 cents per gallon wholesale, but some of which is being shipped by private contractors to Guzman and other Mexican points for resale to the army is also subject to a Mexican import tax of approximately 4 cents per gallon, on top of which must be considered the freight to Guzman, no small item in itself, and the contractor's profit, so it is fair to assume that the gasoline purchased in Mexico is costing the army better than 30 cents per gallon, while the average, between purchases here and purchases in Mexico, will run around 26 cents.

As the army will use at least 7,500 gallons of gasoline daily, this one item runs into no inconsiderable sum. The amount of oil required is also large.

SCOUT CAR IN NEW ENGLAND

Boston, Mass., April 8—Governor McCall, of Massachusetts, showed his interest in military preparedness when he started a Dodge Brothers car off on a trip throughout New England last Thursday from in front of the state house. Before the car ends its tour it will have traveled through the six states gathering a mass of interesting information about the various highways and their military value in time of necessity, also the chance of gathering motor vehicles at short notice. The car is in charge of C. W. Henry, an officer of the 5th regiment, M. V. M., and it carries a complete equipment for making topography details. Governor McCall and Adjutant-General Cole gave Mr. Henry letters of introduction to the officials in the other New England states. The object of the trip, as explained by C. S. Henshaw, Dodge Bros. dealer, who planned it, is to prepare motor scouts in New England to be in a position to summon vehicles, and to know the shortest cuts and by-paths in emergencies.

FORM-A-TRUCK URGES RESERVE

Chicago, April 8—The Smith Form-A-Truck Co. is calling the attention of truck owners, and owners of passenger cars which can be fitted with truck bodies, to the assistance they would be able to offer Uncle Sam if they will organize motor reserve corps, such as motorists in New York and Los Angeles have formed. In keeping with the plan of establishing national motor reserves, each company to be made up of machines of the same model, the Form-A-Truck company urges individuals to offer their cars for the service.

In the event that the government had need of the motor reserves, the various machines would be converted to military trucks under arrangements existing with the different manufacturers. By this plan, the Ford owners or others could offer their cars for military use and permit them to be fitted with truck bodies when needed. Firms operating trucks are asked to join the movement, which is being promoted by the National Committee of Home Defense.

VINCENT TO TALK ON AIRSHIPS

Detroit, April 10—Motors of the Air will be the subject of the talk of J. G. Vincent, vice-president of engineering of the Packard Motor Car Co., while vice-president of the sales division of the Chalmers Motor Co., will have as his subject Interpreting the Public to the Engineer. Both talks will be delivered on April 17, at the meeting of the Detroit Section of the Society of Automobile Engineers, which is to be held at the Hotel Ponchartrain.

KNIGHT TIRE RE-OPENS

Canton, Ohio, April 8—The Knight Tire & Rubber Co., this city, closed since last week on account of a shortage of rubber, has reopened. The shortage was due to the freight tie-up in the east and for a time looked serious. Two hundred men have been laid up during the week.

SUFFRAGETS ARE MOTORING

New York, April 10—Christened the Yellow Kid and captained by Mrs. Alice Snitzer Burke, New York, whose mechanician is Miss Nell Richardson, of Virginia, a car started last Thursday from the National Women's Suffrage Association to make a circuit of the continent in the interest of woman's rights—in this case, especially their rights to vote.

The two women will make the voyage alone and will carry the news that votes for women are on their way. The jaunty little yellow car will carry the banner of the National association at the mast head, and when the shades of night fall, will alarm the natives by developing four monstrous yellow eyes. At each stopping place the Yellow Kid will become a rostrum.

The car was sworn over to keep the peace and speed limits, avoid ditches and spare pedestrians. Its route lies through Washington, to Virginia, and down the Atlantic seaboard, touching New Orleans and Galveston, then along to Texas, New Mexico and Arizona border to California. They expect to reach California some time in May. The return will be through Oregon, Washington and thence through the northern states to New York.

DETROIT S. A. E. CHOOSES OFFICERS

Detroit, Mich., April 8—The Detroit section of the S. A. E. announces its nominations for officers with the following changes in personnel: D. McCall White, chief engineer of the Cadillac Motor Car Co., to succeed George W. Dunham as chairman; O. E. Hunt, vice-chairman; W. C. Rands, treasurer; Bernard G. Koether, secretary; K. W. Zimmerschied, nominated as member of the national nominating committee.

SCHWALBACH LEAVES PERLMAN

New York, April 10—Alexander Schwalbach, formerly with J. S. Bretz and Co., and more recently connected with the development of the Perlman Rim Corp., has severed his connection with the latter. Mr. Schwalbach has not as yet made any plans for the future.

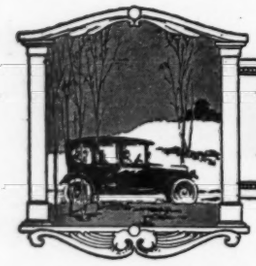
E. VON ROSEN GETS DIRECTORSHIP

Detroit, Mich., April 10—E. E. von Rosen, well known in the motor car industry, has been elected a director and also secretary-treasurer of the Saxon Motor Car Co. Mr. von Rosen was formerly comptroller of the United States Motor Co., and during the last three years was assistant comptroller, general auditor and assistant treasurer of the Maxwell Motor Co.

WHITE DIRECTORS ELECTED

Cleveland, O., April 8—At the annual stockholders' meeting of the White Motor Co. the following board of directors was elected: Windsor T. White, Walter C. White, A. R. Warner, E. W. Hulet, Otto Miller, M. B. Johnson, and J. R. Nutt, of Cleveland; and J. Horace Harding, A. Mitchell Hall, second, Theodore Roosevelt, Jr., and E. R. Tinker, of New York.

The White Motor Co. has taken over all the assets of the White Co. with the exception of $500,000, and the capital of the White Co. is reduced to that amount. All of the capital stock of the White Co. is owned by the White Motor Co. and the former will be continued as the selling company for the latter.



EDITORIAL PERSPECTIVES

Bob Burman

MOTOR car racing owes a great deal to the late Bob Burman, whose sudden death motor racing enthusiasts generally will regret. Burman has made hosts of friends by his fearless driving. He drove to win. It can never be said of Burman that he was a grandstand artist; rather he was a typical dare-devil at the wheel, a driver to whom fate has been kind for many years, but who at last has had to acknowledge the relentless hand.

BURMAN, in his meteoric racing career, drove many a hard race. Often his stamina was greater than that of the car he piloted. He never was looked upon as a strong favorite in long-distance events because his cars quite frequently failed to stand up under the heavy treatment he gave them. Burman's mind flew over the oiled road surface or over the speedway boards at a faster pace than his car was able to keep going. He drove hard races, never attempting to save himself any more than to save his car. There was no grain of fear in Burman's makeup. His spirit was typical American, a spirit of doing, not pretending. It can never be said of Burman that he ever faced the starter's flag without going for all that was in his car until eliminated.

WITH Burman's memory will be linked the name of Blitzen Benz, that mammoth racing car with which he established the world's beach record of a mile in 25.4 seconds in 1911. While he drove many other cars, the racing public associates the name of Benz more closely with him than any other. Besides an expert racing pilot, perhaps as great a pilot on mile dirt tracks as ever held a steering wheel, Burman was a mechanic of no mean caliber and during the past few years has handled many of the engineering problems connected with his racing cars. When driving Peugeot machines last year, he altered cylinder designs, had cylinder blocks of different piston displacement made for his machines so as to qualify for different events. He has always been the brains back of his racing program and his victories have been Burman victories. He has been his own manager, has developed his own materials for his campaigns, and in short, in his brief career, has shown individuality and independence of thought that should be an example to many other racing pilots. It was Burman's hope to be instrumental in bringing the speedway championship unquestionably to America with an American car, and he was at work upon a car which he hoped would do it.

The Future of Racing

WITH a circuit of ten large speedways and a scarcity of racing cars it is necessary that speedway promoters consider how best to conserve the supply of cars and how best to give the spectators the most for their money. This is not an easy program and in solving it more than one year will pass. Last year cannot be considered a profitable year for speedways. Practically all of them had to contend with serious weather handicaps. They all had postponements which meant reduced attendance and lessened receipts. They did not make money.

A FURTHUR trouble with last year's racing was too large prizes were given. Everybody wants to see the drivers make as much money as possible, but if speedways are to continue, then, they must make more money for their owners than they did last year. A few more years like 1915 and several of them will be closed. It is difficult to analyze just why attendance was not larger last year at Indianapolis, Chicago, New York and Minneapolis. In not a single one was the attendance up to expectations. Many stayed away because admission prices were too high. This was necessary because of the $50,000 prize money at each meet. Prizes will have to be cut down for 1916. Fortunately Indianapolis has set the pace reducing from $50,000 to $30,000. Similar reductions will have to be made at all of the other ones.

Developing the Body

PRODUCTION of motor cars has increased so rapidly within the last few years that the body design has not progressed much, further than those changes due to a closer adherence to the stream-line design. The personal comfort factor has yet much uncultivated territory to develop in. It is only natural that buyers are going to give more and more attention to the details of the car body in the future. Thousands of buyers are not so vitally interested in chassis details as a few years ago. This fact has been well demonstrated at the recent national and local shows where many sales, much greater than in former years, have been made without making a study of the chassis. It was either price or body lines and body finish.

IN MANY of the larger cities, custom bodywork is gaining, and more buyers prefer to get a special body to meet their own whims, likes and dislikes. This custom body trade is only possible in the zones of our larger cities where such body manufacturers exist, but the zone is getting larger each year. The custom body is gaining in popularity in cars listing at over $2,000. It is but natural that such a trend should appear. When a buyer spends that amount, he readily can afford to spend another hundred or so on an exclusive body detail, providing he can secure such.

ENGLAND set the pace in body design, beginning 6 years ago, and it was due entirely to the demands for special designs from the buyers, who wanted something a little different from their neighbors. They paid a good round price for the vehicle and, by adding a little more, it was possible to get a special job that perhaps was worth it from the mere comfort viewpoint. When $2,500 is paid for a car it is at least rational to suppose that the seats will be entirely comfortable to the people in the immediate family of the purchaser. Why should his wife have to ride in a $2,500 car in which the seat is too high, so that her feet cannot reach the floor or the foot rail? Why should she ride in a car that has a foot rail that is useless? Why should she ride in a car the upholstery of which catches her back in the wrong place? Why should she ride in a car the seats of which cramp her? Why, when $2,500 is paid for the vehicle, perhaps $3,500, perhaps $4,500? It is only natural that such buyers look for custom work and it would be good merchandising on the part of makers of high-priced cars to give options on many parts of the body that will add to the comfort of those who use the car. The day will come when body lines and comfort will be the turning points and perhaps stronger selling points than the number of cylinders, the type of spring, or the make of starter.

Is the Differential Necessary?—Arguments Pro and Con

Whether a Car Is So Equipped or Not Has Much to Do with the Wear on Tires and the Tendency to Skid

CHICAGO, April 10—Since the memorable Decoration Day 5 years ago when Ray Harroun drove the Marmon Wasp to victory in the first 500-mile Indianapolis speedway race, it has been a pertinent question as to whether a differential is really necessary in a motor car or a motor truck. The Marmon Wasp did not have a differential when it won that race. Since then there have been many performances made on cars without differentials. Two years ago the Sunbeam was driven in the Indianapolis race without a differential. It was not a winner, but made a most creditable performance until a certain part of the race was reached when without any apparent reason its average suddenly dropped. Later it was learned that the car took a dangerous skid on a turn when a tire blew and it was owing to the possibility of repetitions of this that the speed was cut down.

Bus Without Differential

Since then little has been heard about the elimination of the differential, although many experiments have been made by manufacturers. One of the most interesting experiments is that of the Fifth Avenue Coach Co., New York, which operates approximately 150 double-deck buses with accommodation for forty to fifty persons each on the streets of New York. One of its buses from which the differential was removed has covered 30,000 miles to date. The original tires on the rear wheels last 15,495 and 16,000 miles respectively. When they were removed they were not worn out. This mileage for tires compares very favorably with the average tire mileage of 11,000 on these buses. The company does not believe the test has been conducted far enough to demonstrate that the differential can be entirely eliminated.

The question of skidding with motor buses is naturally important as they are frequently operating on wet asphalt pavements where skidding is apt to occur.

G. A. Green, chief engineer of the coach company, reports that there is less skidding when braking without the differential than there is with it. About the only handicap the drivers reported from the bus was that it was more sluggish in making corners than other buses with the differential.

One of the attractive advantages of the rear axle without a differential is that it materially reduces the weight which is a factor in that dead axle weight is hard on tires. There are certain changes in design necessary in an axle not having a differential. The Sheldon Axle & Spring Co. has been experimenting with axles from which the differential has been eliminated with satisfactory results. It is necessary to use stronger axle drive shafts where the differential is left out than where it is used.

The question of additional tire wear without a differential naturally appears as the first objection to leaving the differential out. On analysis this difficulty does not seem so serious.

For example: the sharpest turn made by a motor vehicle in service is of about 20 feet radius, and very few turns are made as sharp as this, the majority of deviations from the straight line being 100 feet or more in radius. Taking the extreme case, imagine a vehicle with 34-inch tires making a turn at 20 feet radius. Turning through a right angle the inner wheel will be 20 feet from the center of turning and the outer wheel 24 feet 8 inches, so the distance traveled by the inner wheel in making the turn will be 15.7 feet and that covered by the outer wheel 19.3 feet. Now the 34-inch wheel covering these distances will, if rolling freely, make 1.76 and 2.16 revolutions, the difference being .4 revolution. It is still a mooted point as to which wheel does most of the slipping, under these circumstances, but it is safe to assume that it will be mainly the inner wheel. This slipping, of course, causes some wear. Turning to the other case, where a differential is fitted, it is not possible to calculate the slip.

The reason that the solid axle reduces the tendency to skid when braking is because either rear wheel must continue revolving if the other is turning. If one wheel rests on a wet patch and the other is on dry road, that on the wet can be made to lock by a light application of the brake. Directly a wheel ceases to revolve and begins to slide it is useless for controlling the direction of the vehicle, it merely takes the path along the road which offers the least resistance, and variations in the condition of the surface cause the locked wheel to try to follow a tortuous path. If the other wheel is locked also the rear end of the vehicle will have no sense of direction, whether the axle has a differential or whether it has not, when one wheel is locked and the other, being on dry road, is not locked, then the latter is liable to be pulled out of its path by the gyrations of the former, but when both turn together, at the same speed, as they must do with the solid axle, then both keep their sense of direction.

See America First — See America Now

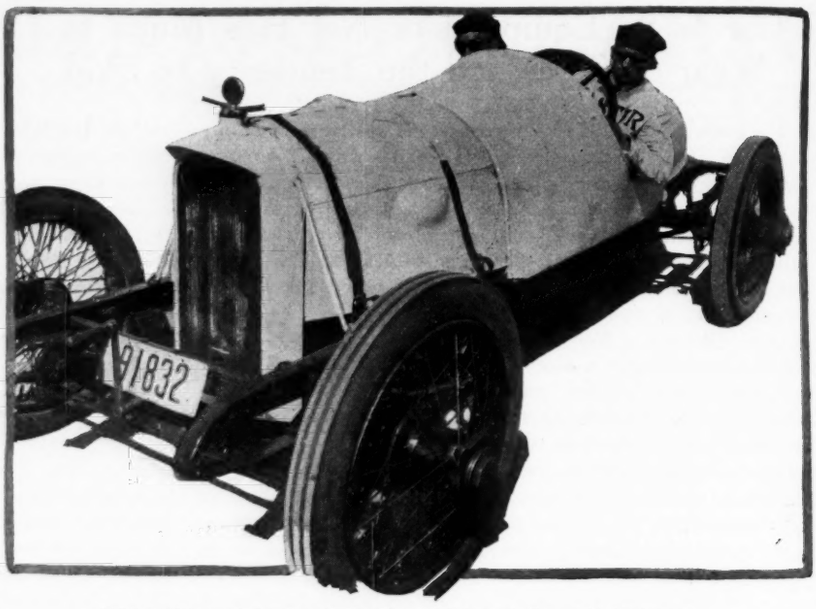
EDITOR'S NOTE—This is the seventy-fourth of a series of illustrations and thumb nail sketches of the scenic and historic wonders of America to be published in Motor Age for the purpose of calling the attention of motorists to the points of interest in their own country.

NO. 74—OLD PLAZA HOTEL, 100 MILES SOUTH OF SAN FRANCISCO

ABOVE is shown the old adobe hotel opposite San Juan Bautista Mission in the town of the same name on California's state highway, along the coast, 100 miles south of San Francisco. It was built in 1856 and has served a famous cuisine since that time. It uses the great beds of mission days

Bob Burman Killed in Corona Race—Won by O'Donnell

Peugeot Driver, Running Second Behind Winner, Has Fatal Upset



Eddie O'Donnell in the Duesenberg, victor at Corona's last race

Death Throws Shadow Over Victory of the Duesenberg Car

CORONA, Cal., April 8—Special telegram—The Grim Reaper touched the opening event of Corona's racing season, snuffed out the life of Bob Burman, his mechanic, Eric Schrader, and a policeman, and is responsible for the final curtain on racing at Corona. Immediately following today's race, officials announced that with the tragic ending of today's event came the decision never to hold another race on the boulevard course. The effect of today's fatalities overshadow Eddie O'Donnell's victory in a Duesenberg at the rate of 86.5 miles per hour.

The times for those who finished follows:

Car	Driver	Time	M.P.H
Duesenberg	O'Donnell	3:29:52	86.5
Mercer	Thomas	3:36:01	84.0
Mercer	Pullen	3:38:36.4	83.0
Omar	Tetzlaff	3:58:04	76.1
Cyclone	Durant	4:05:24	73.9
Gandy Special	Waterman	Flagged	

Twelve Cars Start

Twelve cars were at the starting line when the signal was given and it was believed that Pullen's record of 87.8 miles per hour set last year would fall. In practice, the drivers had shown wonderful speed, and during the tryouts Hughes made laps at 106 miles an hour. There were five cars in the race that had lapped the course at better than 102 miles an hour in practice, but during the practice dashes the weather had been cool. The intense heat today had a great deal to do with seemingly slow time made by O'Donnell.

Burman's car was wrecked in the ninety-seventh lap, when he was in second place and less than a lap behind O'Donnell. Waterman, Oldfield and Hughes went out in the forty-seventh lap, leaving but seven cars on the course, which made the race particularly attractive to the drivers, since the purse was split five ways. Earl Cooper had gone out in the fifteenth, and Tahis had left the course with a broken connecting rod in the twenty-ninth.

Cooper's trouble was due to his wreck 3 days ago while traveling at 101 miles per hour. A front wheel left the axle and Cooper escaped death by a miracle. Both he and the mechanic, Reeve Dutton, escaped without a scratch, but the car was badly damaged. Cooper worked for 48 hours with a corps of mechanics and had the Stutz at the starting line, but the engine had been strained so that the crankshaft was out of alignment and engine trouble developed from that cause early in the race. Tetzlaff's Milac was cut out of the lists at the last moment, due to a connecting rod being broken in the last practice. Injury to Omar Toft caused his withdrawal, and Tetzlaff took over his mount, coming in fourth.

The Apperson was eliminated before the start. Blowing a tire on the back stretch, near the point where Burman was wrecked, Sterling Price lost control of the car, and after careening down the course for 200 feet, crashed into a palm tree. The car burned when the gasoline tank exploded. Tony Jeanette's Hartmann special, a post entry that went in the day before the race, also was a victim of the jinx before the start, a broken connecting rod keeping it out of the race. The Marmon entry also was canceled at the last moment by reason of inability of the driver, Jack Welsh, to get tires.

Some tires did not stand two laps, and every driver used all the tires he had in his pits, with the exception of O'Donnell, who went through the entire race with just one stop. The crowd was not so large as at the last Corona meet, there being only 68,000 admissions.

The whole town is mourning for Burman and the little mechanic who rode to death with him. Citizens of the Circle City say that the only reason for the race this year was the fact that there never had been an accident on the fast course, and now that the course has borne a tragedy there never will be another Circle City speed event.

It was an unavoidable accident of the speedway, but it will never be forgotten by the many friends of Burman who saw the tragic ending of the race today. The main cause of the accident was the blowing of a rear tire. Burman had signalled that he was to change tires on his next trip around, but he never reached the pits. He led the contest at the start and for seven laps he was out in front. Then he dropped back to second and Pullen took the lead, holding it until the fortieth lap, when O'Donnell went into first place, from which he never was headed.

The Accident

Burman stopped at his pit on the eleventh lap with a slipping clutch. He could do nothing for it and drove the race without any but his high gear. To start the car, after coming into the pit, he would jack up the rear end, and after the wheels were turning, with the Peugeot in high gear, the car would be let down in a pool of oil and the start made on high. Several times Bob was up in second place and then he would have to stop to change tires.

With only high gear, the car was hard on tires. It seemed as if Burman was always at his pit and it was hard to believe that he was in second place when it was shown on the scoreboard in the eightieth lap. He had less than a lap to make up when O'Donnell was making his first stop.

The Race by Laps

Driver	Car	Position by laps 10	20	30	40	50	60	70	80	90	100	109	Time
O'Donnell	Duesenberg	4	3	2	2	1	1	1	1	1	1	1	3:29:52
Thomas	Mercer	3	5	3	4	3	3	3	4	4	2	2	3:36:01
Pullen	Mercer	1	1	1	1	5	5	5	5	5	5	3	3:38:36⅘
Tetzlaff	Omar	5	4	4	3	2	2	2	3	3	3	4	3:58:04
Durant	Chevrolet Cyclone	10	9	9	9	7	7	7	7	6	5	5	4:05:25
Waterman	Gandy Special	7	6	5	6	6	6	6	6	7			Flagged
Burman	Peugeot	6	2	6	5	4	4	4	2	2			Wrecked 97th lap
Oldfield	Delage	9	7	7	7								Broken rocker arm 47th lap
Gandy	Gandy Special	11	10	10									Engine trouble 47th lap
Hughes	Sunbeam	8	8	8	8								Broken clutch 47th lap
Teel	Tahais	12	11										Broken connecting rod in 29th lap
Cooper	Stutz	2											Engine trouble 15th lap

Burman was driving the greatest race of his career. He had been in the back and had come up into the money several times during the race, and it seemed that he had a sure thing in second place and an even break for first when the accident happened.

When the left rear blew, the car went for the inside curve. After sliding down the curve about 100 feet it struck a culvert and that flattened out one side of the wheel and bent the frame. The car then lurched out on the course, swung back to the curve, and with one wheel in the gutter and the other on the curve, it plowed through two telephone poles, tore up 100 feet of grass on the edge of the course, hit the curb again, crashed into a motor car standing on the inside of the course, then spun around, rolled over, and finally came to a stop 167 yards from where it first hit the curb.

Shrader was thrown out when the car hit the first telephone pole. W. H. Speer, a police officer of the course, was killed a second later, just after the car had torn down the first pole. Shrader lived 4 minutes.

Burman was given immediate attention, his leg was set and he was sent to Riverside hospital, where he died at 5:55 this evening.

Burman's injuries consisted of a broken leg, three broken ribs, a basal fracture of the skull and internal injuries. Shrader also suffered a basal fracture, but his internal injuries were so great that he died from internal hemorrhages. O'Donnell, who had finished and won the $5,000 purse, with Hughie Hughes and the rest of them, felt the tragedy keenly.

RAISIN CLASSIC ROAD RACE

Fresno, Cal., April 8—The San Joaquin valley is busy with preparations for the great festival of Raisin Day, which will be celebrated in Fresno and observed throughout the country on April 28.

One of the principal features of this fiesta will be a $10,000 trophy raisin classic road race, plans for which are being shaped by the Raisin Classics Motor Cup Holdings Co. In view of the valuable trophy that will be offered, it is expected that this event will attain in the racing world a prominence equal to that of the Vanderbilt cup. Details of the race have not yet been decided.

TWIN CITIES TO STAGE SPRINTS

New York, April 10—The contest board of the American Automobile Association has received a request from the Twin City Motor Speedway Co., Minneapolis, Minn., for sanction of six sprint races to be held on May 30. The main event of the day will be a 5-mile race for a purse of $2,000. Three shorter events will carry a purse of $300 each and the other two, also sprint affairs, will be for trophies.

The main event of the season at the Twin City speedway is scheduled for July 4 when the 300-mile International race will be held. In September another meet will take place on the track, according to present plans, although nothing has been decided in regard to the details except that sprint races will probably be the feature.

Bob Burman

BURMAN, frequently characterized as the world's speed king, was born in Imlay City, Mich., April 22, 1884. He tested the first car ever manufactured by the Buick Co. and then entered the employ of the Jackson Automobile Co., becoming head tester. While thus employed, a resident of Jackson, Mich., built a freak racing car and invited Burman to enter into a contest with him. This Burman did, and although he took a long chance of being defeated, won his race by more than a mile. This early success decided him to enter the racing field and he induced the Jackson Co. to allow him to enter one of their cars in a 50-mile race at Detroit in 1906.

He won against a field comprising practically all of the leading racing drivers in the country. With the Buick cars, which he drove later, Burman won so many races that he attracted attention all over the world. During 1912 Burman participated in thirty-five meets in all parts of the country. One of his exploits was the speed trial he made over the soft beach course at San Diego, Cal., when he covered a mile in 28 seconds. While attempting to repeat this performance the following day his car caught fire and Burman, surrounded by flames, jammed on the emergency brake and drove the car into the ocean.

His most famous achievement was his world's record drive against time at Daytona, Fla., in April, 1911, when at the wheel of the Blitzen Benz, he covered a mile at an average of 142 miles an hour.

Burman held five records on the straightaway regardless of class. They are the 1 kilometer, 0:15.88; 1 mile, 0:25.40, and 2 miles, 0:51.28. These three marks were made in his Blitzen Benz at Daytona, Fla.; the other two were made in the Buick Bug at Jacksonville.

Burman held the quarter-mile speedway record made in his Blitzen Benz at Indianapolis in 0:8.16 and the 1-kilometer record, made at the same place, in 0:21.40. He also held six recognized records on the circular dirt track.

It was Burman's greatest ambition to bring the speedway championship unquestionably to America with an American car, and to be the first speed pilot to drive at the rate of 180 miles per hour—3 miles per minute. He honestly believed he would be able to do this, as in 1911, when he broke the world's records, he made unofficial trials at the rate of 155 miles per hour.

HUDSON MAKES 102 M.P.H.

Daytona, Fla., April 10—A Hudson Super Six stock chassis, electrically timed, today established a new record by negotiating 1 mile in 35.12 seconds, on the Ormond-Daytona beach. This is at the rate of 102.5 miles per hour. Five other trials were under 30 seconds. The car is rated at 29.4 horsepower, and develops 77 horsepower at about 2,500 r. p. m.

This new record compares with Burman's mark of 25.40 seconds in the 200 horsepower Benz at Daytona, April 23, 1911, at the rate of 141 m.p.h.; Marriott's mark of 28⅕ seconds in a 30 horsepower Stanley steamer at Ormond, Jan. 22, 1907, at the rate of 127.66 m.p.h., and 40.32 seconds made by Wilcox in a 301-450 National.

PATTERSON MAKES FAST TIME

Chicago, April 10—E. C. Patterson, driving a Cadillac, made the best time yesterday in the trials at Speedway park for the non-professional drivers' race to be held May 20. Patterson averaged 74½ miles an hour for ten laps or twenty miles. Seven other entrants in the event were giving their cars workouts and making speeds in the neighborhood of 73 and 74 miles an hour. The cars out included Mercers, Cadillacs and Packards.

BEN HURS TO BE STANDARD

Chicago, April 11—The Ben Hur cars which are being built to represent the Chicago speedway during the 1916 racing season, it is announced today, will be the first models of a series which will be produced for the regular market. While of course they cannot be advertised as such, it is stated that these cars will be standard models so far as the chassis and engine is concerned, that is, the regular production of the factory will be the same in design and manufacture as the cars which will make their debut on the tracks this summer.

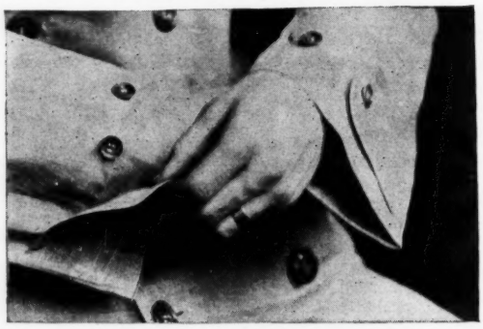
David F. Reid, president of the Speedway Park Association, while admitting that members of the association were interested in backing a team of racing cars to represent Chicago, announces that these cars will not be owned by the Speedway Park Association proper or campaigned by it. It has been decided to campaign the team under the title of the Ben Hur Racing Association which is organized under the charter not for profit. No dividends will be declared, the initial capital being subscribed by fifty or 100 members of the Speedway Park Association. It is the expectation to have the team ready for initial bow at the Indianapolis Memorial Day races.

A golf cap of khaki which will be seen frequently on the links this summer

This tan linen duster provides suitable protection for those who motor and wish to keep their clothing immune from dust and grease, or water

A clock hat of fancy texture. This model has a stitched brim

Brown mixture rainproof cheviot coat with raglan sleeves



The cuffs on this duster are adjustable and dustproof

Here is a coat of brown mixed material. It has the raglan sleeve and is rainproof. The goods is cheviot and the cut is large and gives plenty of room

What Boys Who Motor Will Wear During the Spring

BOYS' outer garments for motoring this spring have not changed very much in design. The same plan as last and former years has been adhered to in the use of materials that will not show dust and dirt and will stand the wear given them by the average boy—also to design them so as to afford complete protection against showeds and dust.

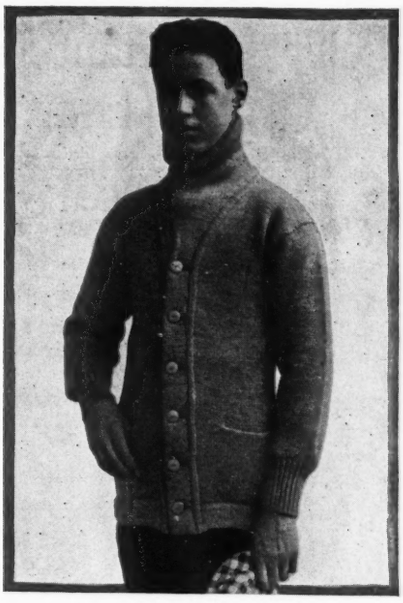
The designers have accomplished this plan, first by the use of such materials as tan colored linen, tan colored gabardine, and fancy mixed cheviots. The linen materials are mostly used for small boys' dusters because they can be easily laundered. Tan and light colors are the most popular, as they follow along the lines of least resistance when in use for boys who are playing in the streets or are in the dust.

This year there is quite a large demand for linen dusters for boys from 4 years of age up to the larger sizes, especially on account of the features outlined in the previous paragraph—protection against dust and rain. This has been accomplished by the use of adjustable cuffs and collars. The collars are convertible and are made to roll and button close and high on the neck and a tab on the cuff is used to tighten the sleeve at the wrist so as to prevent any dust or dirt from entering and soiling the shirt cuff. Side pockets with additional opening to the trouser pockets follow along the same lines of design. Another feature is the use of a detachable tab around the neck.

The cut of the coats in general is conventional, being double breasted with plenty of flare at the skirt for roominess. The spring overcoats are of light weight and are made single breasted with raglan shoulders, side pockets, and in fancy mixed cheviots. The sleeves of these coats are silk lined, while the rest of the garment is made skeleton.

Brushed wool heather mixture sweater. This is light weight with V-neck

Dark tan mackintosh; note collar



Shaker knit all wool sweater with shawl collar and seamless inside pockets

Tan gabardine coat, raglan model. Golf cap of checks

Brushed wool heather mixture sweater with shawl collar, a neat model

Tartar plaid rainproof cheviot coat, raglan model. This coat is very loose

Tells Important Details of the Wisconsin Racing Engine

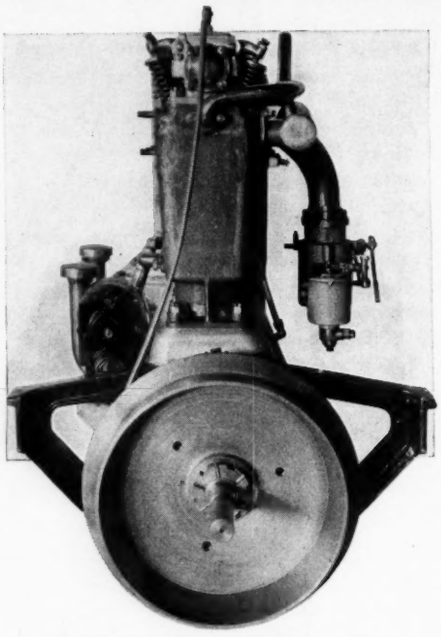
Maker of World's Champion Motor Explains Its Construction

CHICAGO, April 8—That there need be little change in valve timing of racing engines as compared with the timing of engines for ordinary touring purposes was one of the many points of interest with regard to the design and construction of motors for speed purposes developed at the quarterly meeting of the Mid-West Section, Society of Automobile Engineers, at the Chicago Automobile Club last night. The feature of this first professional session of the new section of the society was a paper presented by Charles H. Johns, president and general manager of the Wisconsin Motor Mfg. Co., Milwaukee, Wis. Mr. Johns' paper was entitled, "American Racing Engines," and in its preparation he had the assistance of A. F. Milbrath, secretary, superintendent, and engineer of the Milwaukee company.

Based on Racing Engine

Mr. Johns' paper naturally was based upon the engine built by his factory, as exemplified in the racing motors which have made such a wonderful showing in the Stutz speed cars. The paper took up the development of the Stutz racing motor both by the Wisconsin Motor Mfg. Co., and the Stutz Motor Car Co. It also gave some correlations and comparisons between American practice as exemplified from these motors, and the foremost European types, and ended with a very complete and thorough description of the Stutz racing motors, which won the international championship for America last year.

Inasmuch as this is the first time in which the details of construction and design of the Stutz racing motors have been made public, the paper aroused an extraordinary amount of interest among the fifty engineers present, and the discussion



Front view of the Wisconsin motor

at the close of the paper brought out some additional features of interest. The engineers were particularly enthusiastic over the power and speed curves exhibited by Mr. Johns, as well as the sectional drawings showing the internal design of the engine.

Mr. Johns' paper is given in part below:

American Racing Engines

BY CHARLES H. JOHN,
President Wisconsin Motor Mfg. Co.

T is my unqualified belief that the phenomenal growth of the automobile industry is directly traceable to racing. Weaknesses of any nature in the construction of a self-propelled vehicle can only be ascertained by actual tests and usually these have to extend over a long period, perhaps a year and more, often a longer period of time is required.

Having from previous experiences learned the design and materials to be used, a car is built and entered into a big race, because in a big race its design and materials will be thoroughly tested out and the various parts fatigued within a few hours to such an extent as would not have been possible under other conditions in a year's service. The motor particularly, being called upon to do yeoman service, is subjected to enormous strain. If any part of the motor proved weak or not suited for the work required, changes are made, to be tested out in the next race.

In the early days of racing, stock cars were used entirely, or slight modifications were made in them, such as stripping them of all unnecessary parts, tuning up the motor and minor other alterations. If more speed was sought, larger motors were employed, and today we still see the enormous power plants exhibited in the Blitzen Benz and the Fiat. A limit, however, was soon reached, as it was found that a large motor required a stronger transmission, stronger axles and a heavier construction throughout, and as the motor size increased the cars became more cumbersome, harder to handle and really no faster than the smaller ones. It was, therefore, obvious that procedure in another direction was necessary to get results. If an engine could be built which would be small and light, but still capable of great power, success seemed assured.

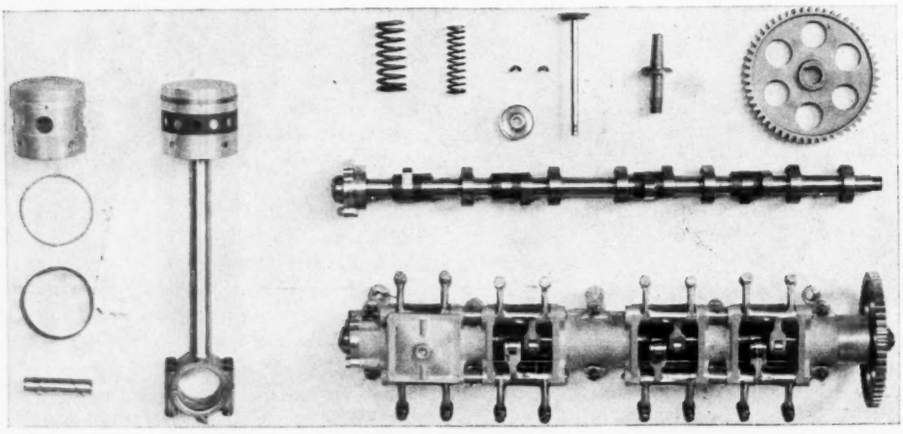
Use of Light Alloys

In the high-speed motor the underlying principle is to reduce the weight of the reciprocating parts to a minimum for safety. By reducing the weight of these parts the inertia forces are reduced, which are the causes of excessive vibration at high speeds and which waste much power by reason of the extra friction. This is accomplished by using better materials for the connecting rod and piston. Chrome vanadium connecting rods, heat-treated, of exceedingly light weight, and pistons of special aluminum alloy, reduced the inertia forces to a minimum and greatly relieved the stresses upon the connecting rod as well as on the bearings. Alloy steels were also employed for the crankshafts, bolts, gears and other parts subjected to excessive strains. The microscope is used to determine the proper heat treatment and the scleroscope to get the proper hardness. Valve springs had to be made of vanadium steel and tungsten steel was developed for valves. Bearing metals are given special study, as under the great pressure and high speeds ordinary metal would burn out in a short time.

Racing, and naturally, also, high-speed engines, have compelled the engineers to give the question of correct lubrication their minute attention. The result of their labors was the introduction of high-grade motor oil, and this, to some extent, has eliminated a great many motor troubles. In these high-speed motor tests it was also discovered that oils, when exposed to very high temperatures, would deposit a sediment in the oil chamber. This was largely eliminated by cooling fins in the piston, also cooling fins on the crank base. In a test made with one of the large Wisconsin six-cylinder tractor motors, we found that running the oil through cool water, which was made possible on account of our forced feed oiling system, increased the efficiency nearly 10 per cent. This taught us a valuable lesson, and we now are cooling the oil on our tractor motors by means of a jacketed inlet manifold. This manifold has double duties, to-wit: cools the oils and at the same time heats the incoming gases.

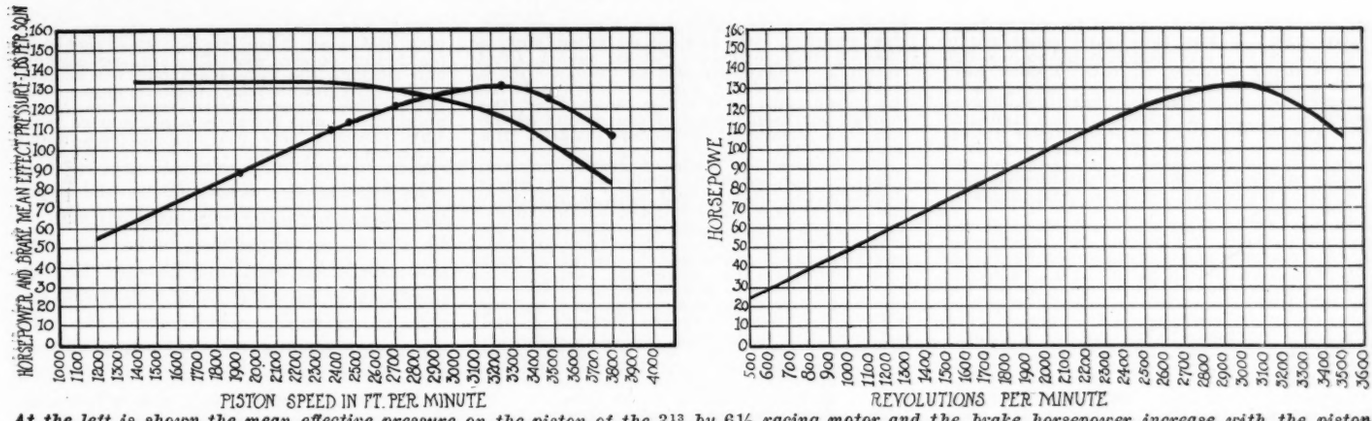
I attribute a great deal of the success of Wisconsin motors in racing annals to their perfect oiling system, which in all of our motors is the forced feed type. The oil is contained in a separate oil sump and is forced by a gear pump through ducts to the main bearings and then through holes bored in the crankshaft to the connecting rod bearings. The oil under pressure is forced from each side of the connecting rod bearings and is thrown in all directions. In this way oil is splashed against the cylinder walls, pistons, push rods and into pockets over the camshaft bearings. Oil is also fed directly over the timing gears by means of a copper tube leading from the main duct. The oil then drains back into the sump through a strainer and is there ready for another journey. This, in the opinion of many engineers, is the most efficient and economical oiling system yet introduced. In a ten-hour continuous test recently made at our plant on a high-speed motor, the consumption of oil was slightly over 1-100 pint per horsepower per hour.

As the amount of power available from an engine depends upon the volume of gas consumed in a given time, it was evident



Dissembled view of the Wisconsin motor parts showing details of valves, cams, connecting rods, pistons and rings

Mid-West Section S. A. E. Hears Paper Read by Charles H. John


HORSEPOWER AND BRAKE MEAN EFFECT PRESSURE-LBS PER SQ IN
PISTON SPEED IN FT. PER MINUTE
HORSEPOWER
REVOLUTIONS PER MINUTE

At the left is shown the mean effective pressure on the piston of the 3⅛ by 6½ racing motor and the brake horsepower increase with the piston speed. At the right is the increase in horsepower with crankshaft speed. Note high points of 131 horsepower at 3,000 r. p. m.

that by using smaller cylinders and allowing the crankshaft to revolve faster, the same amount of power could be obtained as from a large engine revolving at slower speeds. Extensive trials also proved that the long-stroke motor was capable of greater speed and increased power over the short-stroke motors. This led to the development of the present 300-cubic inch racing motors which I will describe more fully.

The 300-Cubic Inch Motors

The Wisconsin Motor Mfg. Co., from its inception, recognized the increased benefit which could be derived from racing, and always encouraged the development of this fascinating and instructive sport. One of the very first motors built by my company was shipped to Harry Stutz of Indianapolis, who was then an unknown but capable engineer and designer of motor cars. After giving this motor a thorough trial he concluded to enter this car in the 500-mile speedway race. This was purely a stock motor, and when I heard of Stutz's intentions, I made up my mind to journey to Indianapolis to see the race. Results obtained by the Stutz in this race are a matter of record, and surely entitle him to his slogan, "Made good in a day."

It is hardly necessary for me to repeat the succes of Harry Stutz on the speedway, in the road races and in the transcontinental runs. I wish to add, however, that all of the races up to the year 1915 were run with practically our stock T-head motors. Directly after the Indianapolis speedway races of 1914, we concluded that the foreign invaders had carried off enough of our good gold, and we agreed to build four motors for Mr. Stutz that could successfully compete with the foreign racing machines. Our engineer, Mr. A. F. Milbrath, had sketched out one of his ideas which met with Mr. Stutz's approval, and we immediately started to work on these motors. We had heard wonderful tales of a new steel made in Belgium, called B. N. D., with a wonderful tensile strength, and we concluded that we had to get this steel.

Orders for crankshaft and connecting rod materials were placed at once, but alas, war was suddenly declared, and we were compelled to look for other channels of supply. We decided to use chrome vanadium steel, which had given us such excellent service. This was of American make, and the greatest care was exercised in the selection of all materials. The scleroscope and the Brinell tests were resorted to, and in addition, to make sure that the material was correct, physical tests and chemical analysis were made. After heat treatment, specimens were taken from the various parts and examined micro-photographically to insure the granular structure being right. With these precautions, we were able to demonstrate that America can produce steel equal in strength and stability to anything produced abroad, and today American products are at a par with any of European extraction. Our tests convinced us that we had the proper material, so we rushed through a single motor in order to give it a thorough test.

When the first motor was completed and put on the test stands the results were quite satisfactory, but no extraordinary power or speed was developed. A careful study of lubrication and principally ignition was necessary before we were able to get results. When all of these difficulties had been satisfactorily solved, we obtained some very astonishing figures, in fact, they were far above our expectations. This motor of 296.81 cubic inches capacity developed 131 brake horsepower at 2,950 r.p.m., and was at once shipped to Mr. Stutz, whose chassis was ready for the motor. Trials were at once started. It was shown by these trials that this engine was developing extraordinary power, and Mr. Stutz at once notified us to proceed with the other motors. Three cars were built and the performance of these three cars has been among the most remarkable in automobile racing. In the 500-mile Decoration Day races at Indianapolis, these three cars started, and all three finished well up in the running.

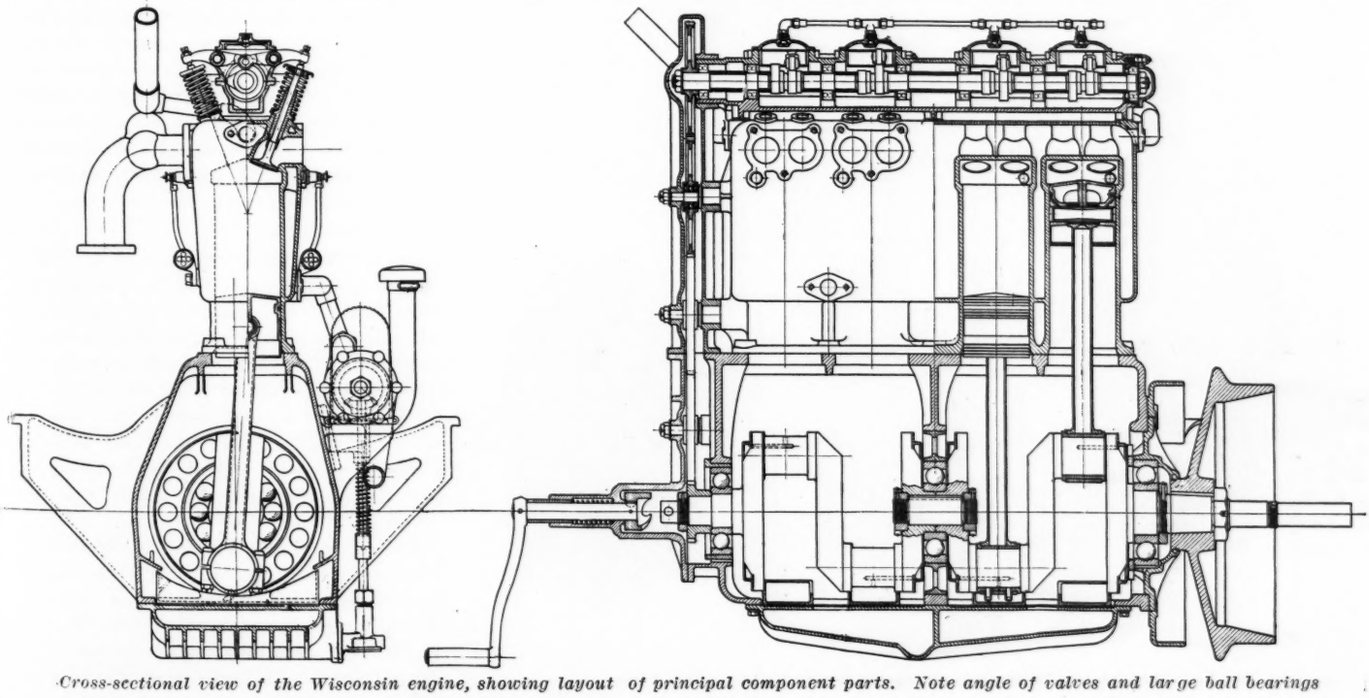
I do not have to enumerate all the victories which Harry Stutz won, as they are matters of history. Foreign engineers have as a rule taken their defeat manfully, and are giving America due credit for designing and building a motor capable of such wonderful achievements.

American engineers have shown that they are equal to their European cousins, American car builders can build just as good a chassis and American steel makers can produce just as good materials, and perhaps better, than the famous steels of Belgium.

Sixteen-Valve Engines

It is well known that a gasoline poppet valve engine follows certain lines, and these lines are fixed and cannot be altered. The valve-in-the-head type has been recognized as the most efficient construction, and it is only a few years that the four-valve superseded the two-valve type. It is not necessary for me to argue the merits of the four-valve type, and neither do I wish to enter into a dispute as to the authorship of this type. I have read of an English engineer claiming he originated this idea, and then again the French claim it, and so do the Italians. We also find that very nearly all of the European racing cars are using four valves, and I will just mention the Sunbeam, Humber, Straker-Squire, Vauxhall, Peugeot, De Lage, Schneider, Mercedes, Isotta-Fraschini and Fiat.

In all of these there is a certain similarity, especially in the combustion chamber, as it is necessary to employ the semi-



Cross-sectional view of the Wisconsin engine, showing layout of principal component parts. Note angle of valves and large ball bearings

spherical shape if one wants to obtain large valve area. It was also found necessary to dispense with valve cages, and so we find valves fitted directly in the cylinder head with ample water jackets surrounding them. These essentials in motor construction were established, and it was now the ambition and aim of the automobile engineer to get the greatest amount of power out of a given cylinder volume for the greatest length of time. The fact is established that we took their own weapons and defeated them squarely.

It may be of interest to members of the section to hear the details of construction of this motor. The aluminum crankcase of the Wisconsin racing motor is of the barrel type, with rather a large opening on the bottom, but built extremely rigid. The bottom cover is provided with cooling ribs. The main bearings are ballbearing, with one-inch diamter balls, and held in place by means of cast steel retainers. The motor is three-point suspension, the forward end supported by a trunion bearing on the steel front cover plate and the rear carried by a cast-steel arm bolted to the crank-case.

Double Valve Springs

The crankshaft is 2¼ inches in diameter and the material employed is chrome-vanadium steel, double heat treated. It is made in two pieces, the two halves being held together by a large bolt. The cylinders are cast en bloc with ample water jackets around the barrels, as well as around the valves. There are two inlet ports, as well as two exhaust ports, and the valves, which are 1¾ inches in diameter, are seated directly in the cylinder head. The valve guides are of cast iron, but the valves are of high tungsten steel. Two valve springs are used, one inside of the other. This eliminates the danger of the valve dropping in on the piston should a valve spring break.

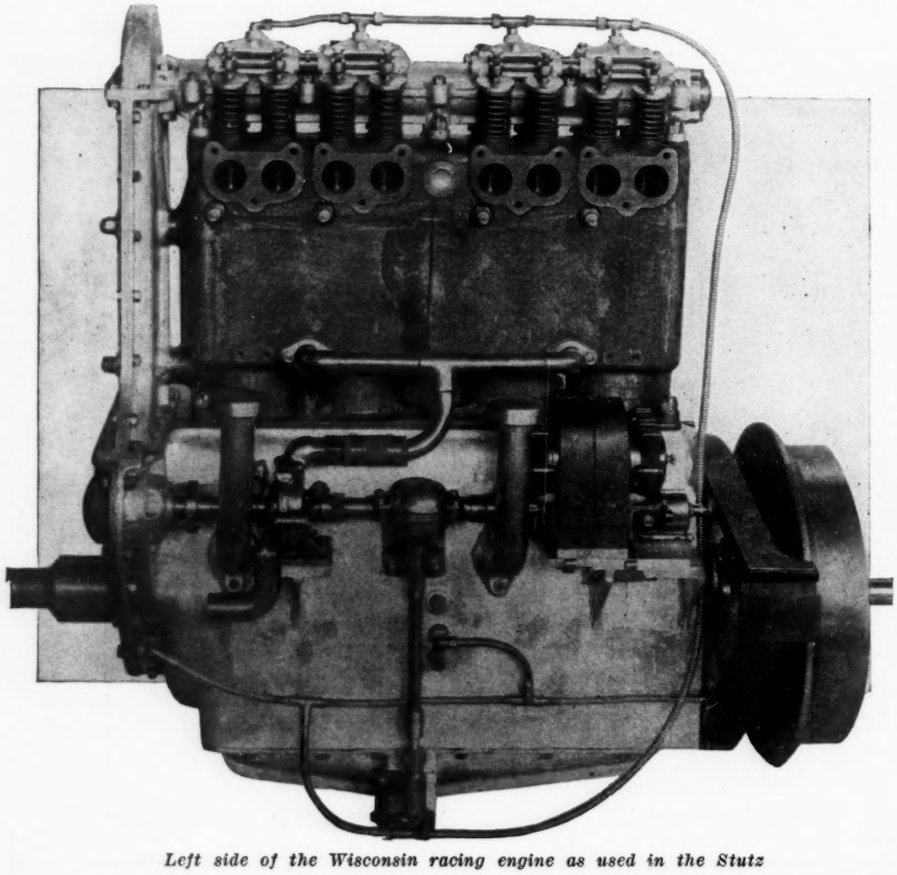
A single camshaft is used, which operates the valves by means of short fork-shaped rockers, one rocker operating two valves. The camshaft is built up and stepped spacers are employed between the cams and bearings, which are ballbearing. The camshaft is driven by means of spur gears ½-inch wide. These gears are also of chrome-vanadium steel, heat treated and run on ball bearings. The gears are enclosed in an oil-tight aluminum housing. A single gear drives the water pump, oil pump and magneto. The front cover plate is of steel, as is also the flywheel.

The connecting rods are tubular, made from a solid forging of chrome vanadium steel. A 1-inch diameter hole is bored through the entire length, making a very light, but at the same time very rigid rod. The bearing end has four bolts, and is bushed with bronge, Fahrig metal lined bearings. The upper end is bushed with a solid bronze bushing with a ⅞-inch hole for the piston pin. This pin is bored taper, the thicker part remaining in the center of the pin and gradually tapering towards the outside.

The pistons are made of magnalium and weigh 12 ounces each. Only one groove is cut into the piston, and this is cut wide enough to hold four rings 1-16-inch wide. The piston pin is neither fastened to the rod nor to the piston, but is free to float, and is held in place by means of a wide steel clip, liberally perforated with holes. The head of the piston is supported by ribs radiating from the center and uniting with a lug which extends through a slot cut into the connecting rod at the top of the piston pin. Two sets of spark plugs were provided for each cylinder, and a two-spark Bosch magneto was used. The weight of this motor is 600 pounds.

The oiling system is of the pressure type, our standard gear pump being used. The oil is carried in the sump and drawn from here through a strainer, after which it is forced through the oil leads to oil rings carried on the crankshaft. These oil rings carried the oil through holes drilled in the crankshaft to the connecting rod bearings, the overflow from the bearings forming a spray which lubricates the pistons, wrist pins and main ball bearings. Oil troughs are also provided under the rods and the rods are fitted with scoops so that a double system is employed for the lubrication of the big ends. The excess oil drained back into the sump. A separate oil lead was taken from the pump to lubricate the overhead camshaft, a small stream of oil being directed onto each cam. The ballbearings carrying the camshaft are lubricated by splash from the cams. The excess oil from the camshaft housing returned to the oil sump through the gear housing at the front end of the motor, also through a return tube at the rear end.

The motors developed their maximum power at about 2,950 r.p.m., or 3,200 feet piston speed per minute. At this speed the brake horsepower was 131. During the races the average speed of the motors was slightly less than above, or between 2,600 and 2,700 r.p.m., at which speed the horsepower was 124 to 128. On the test stand the motors were run up to 3,500 r.p.m., at which speed the horsepower dropped slightly. The maximum pressure on connecting bearings, due to the presure on pistons, was about 600 pounds per square inch.



Left side of the Wisconsin racing engine as used in the Stutz

The mean velocity of gas through inlet manifold was 2,950 r.p.m., the speed of maximum power was 175 feet per second, and through the valves 215 feet per second.

The maximum mean effective pressure in the engine, figured back from the brake horsepower, was 132 pounds per square inch. This pressure was maintained from about 1,400 r.p.m. to about 2,200 r.p.m. At 2,950 r.p.m. it was 118 pounds per square inch.

In opening the discussion on the paper on American racing engines, Chairman F. E. Place, vice-president Buda Co., congratulated the section on having the opportunity to learn the construction and design of an engine which has made such wonderful records on speedways and in road races and has shown that America can produce engines and cars which can show their heels to the fleetest production of Europe. He felt that the paper was particularly timely in that it was presented just before the beginning of a new racing season and in a center where racing interest is most acute.

George W. Smith, engineer of the Thos. B. Jeffery Co., inquired as to the weight of the valve springs employed and as to the method of holding the wrist pin in place. In reply, Mr. Milbreth stated that the valve springs were capable of 40 pounds, and that the wrist pins were fastened neither to the connecting rod nor to the piston, simply floating within the piston and being held in place by a steel ring around the piston, which, however, acted in no sense as a piston ring. In illustrating this, Mr. Johns exhibited a connecting rod, wrist pin, and piston from one of the racing motors.

Mr. Marr, formerly engineer of the Amplex, mentioned some features of the two-cycle racing car with particular reference to the Amplex, which competed in the first 500-mile race at Indianapolis. He stated that the engine was almost the stock motor, but was lightened as to its reciprocating parts as far as possible. The weight of the connecting rod was cut down, but the lightening of the piston was limited by the extreme pressure over the piston head. He said that the motor developed 86 horsepower at 1,650 revolutions per minute for 4 hours, and showed its maximum torque at 1,100 revolutions per minute, and its maximum crankshaft speed was 1,800.

Oil Temperatures

Robert J. Broege, engineer of the Buda company, asked as to the temperature of the oil in the Wisconsin racing engines, to which Mr. Milbreth replied that the temperature ran to 150 degrees on the test stand, but was not so high when running on the track on account of the cooling effect of the air, and that the running pressure decreased slightly with the speed and the power that the motor was developing.

Asked by E. A. Turner, vice-president Northwestern Expanded Metal Co., as to the valve timing, of the racing engines, Mr. Milbreth stated that the timing was no different from that of the stock Wisconsin motor. He said that the timing

of the Wisconsin 300-cubic inch racing engines was as follows:

Inlet opens 10 degrees after upper dead center.
Inlet closes 50 degrees after lower dead center.
Exhaust opens 50 degrees before center.
Exhaust closes 10 degrees after center.

Asked by F. C. Mock, research engineer, Stromberg Motor Devices Co., as to what cylinder volume the 75-feet-per-minute velocity of gas was assumed, Mr. Milbreth answered that this assumption was at full cylinder volume. He stated that the oil temperature, he believed, was lower in the force-feed system employed in the engine described than it is in the splash systems on account of the cooling ribs, but no comparative tests have been made by him.

Asked as to the economy of the engine, Mr. Milbreth stated that no tests have been run to determine the economy at moderate touring speeds. He believed, however, that it would prove very efficient on account of the almost complete opening of the top of the cylinder by the valves, and also the semispherical shape of the combustion space.

Compression Pressures

He stated that the compression space was figured at 20 per cent of the total cylinder volume, and when turned over by hand, a compression of 95 pounds per square inch was shown. The weight of the flywheel was 70 pounds. The spark advance at maximum power was about 30 degrees.

Another feature of the meeting which aroused equal enthusiasm was the exhibition of model aeroplanes by the Model Aeroplane Club of Illinois. Preliminary to the exhibition, Arthur Elton Nealy, of the Model Aeroplane Club, presented a short paper, in which he brought out the value of model aeroplanes in the development af aviation with particular reference to what the models were doing in the development of automatic stability in full-sized machines. He stated that at the present time the full-size machine, so far as its stability and guidance is concerned, is 90 per cent operator and 10 per cent machine. But that in the models, which carry no operators, automatic stability and guidance must be inherent in order to make successful flights, inasmuch as no operators, of course, can be carried in the midget aeroplanes.

In the demonstrations of the flying ability of the models which followed, Mr. Nealy succeeded very thoroughly in proving that model aeroplanes can be made to have a great degree of inherent stability and guiding power. A dozen different types of models were flown within the confines of the assembly hall and the young men who manipulated them seemed able to make them guide themselves with almost human intelligence. The models looped the loop and did similar stunts which have been featured by aviators. The most striking exhibition was that of a model hydroaeroplane which arose from a pan of water 2 feet by 3 feet in size, flew out over the audience, looped the loop and returned to rest in the pan.

NEW FIRM A SEPARATE ORGANIZATION

Detroit, Mich., April 10—Because the impression has been created that the Liberty Motor Car Co. and the R. C. H. Corp. are in some way connected, through the fact that the Liberty company has taken over the plant formerly occupied by the R. C. H. Corp., the officials of the Liberty company explain that there is no relation between the two companies.

5,000,000 CARS FOR U. S.

New York, April 10—With $2,500,000 cars now registered and running in this country, there is still a market for a million cars a year until 5,000,000 cars are in use, according to a statement made by Alfred Reeves, general manager National Automobile Chamber of Commerce. This statement was made at the opening of the twelfth year of the motor car school of the West Side Y. M. C. A.

GENERAL MOTORS BUYS LARGE SITE

Detroit, Mich., April 11—The General Motors Co. has purchased 35 acres of land in the northeastern part of Detroit, adjoining a 58-acre tract which was acquired 3 years ago by General Motors. President C. W. Nash stated today that the property has been acquired to safeguard the Cadillac Motor Car Co. in the event that that company should deem it advisable to locate its plant all in one place. At the present time the Cadillac plants are situated in several parts of the city and such a site as General Motors has provided would mean complete concentration.

The body factory is now several miles from the main works. The remarkable growth of the Cadillac company has meant many additions to the parent plant. Should the company decide to take advantage of the new site it is probable that a much larger plant than the aggregate of the present scattered factory buildings would result.

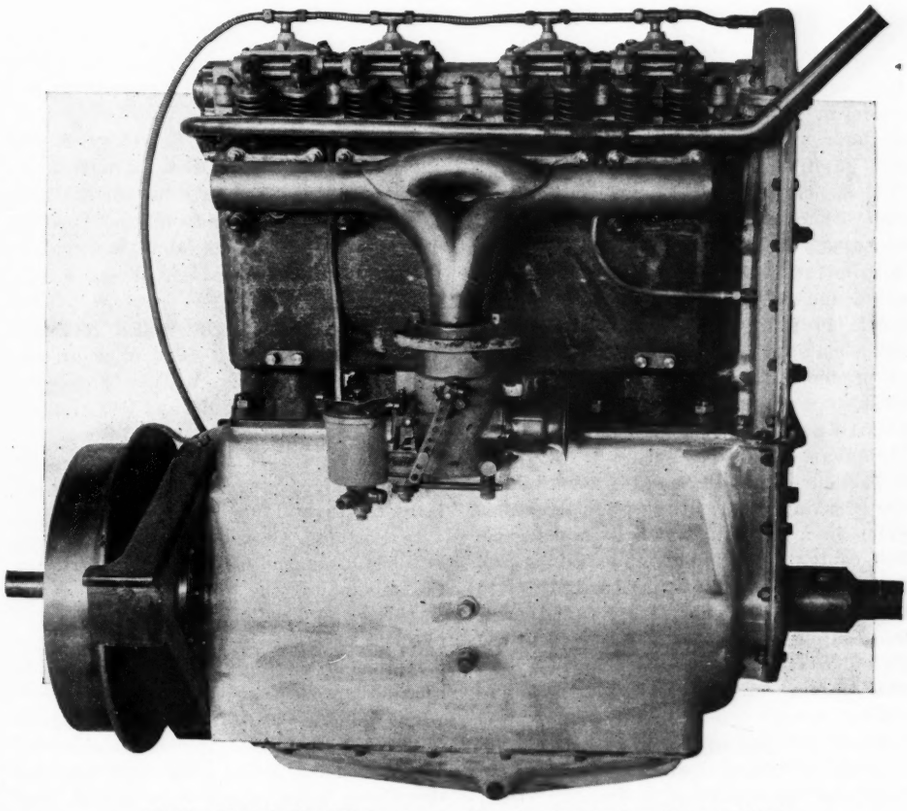
NINTH WINTON REPAIR CONTEST

Cleveland, O., April 8—Entry blanks for the ninth annual repair expense contest for Winton six chauffeurs are ready for distribution. Cash prizes of $3,500 will be paid to the employed drivers of Winton six cars making the best records between May 1 and October 31, the capital prize being $500. No entrance fee is required.

The idea of the contest is to show that Winton six cars can be driven great mileage with practically no repair expense. Records for eight years show a total distance of approximately 2,000,000 miles at an average repair expense of 19¼ cents per 1,000 miles. In eight years, prizes amounting to $25,000 have been paid to prize winners. Sixteen men have won $500 or more each.

TREBLE TAX IN ENGLAND

London, England, April 6—A treble tax has been placed on all British motor cars, ranging from $21 to $630, according to horsepower. According to trade circles, this will not only kill pleasure riding but will cripple the industry.



Right side of the Wisconsin engine showing carbureter mounting

Trade Commission Watches Its Step in Gasoline Quiz

No Solution of High-Price Problem Offered at This Time in Report to Congress by Federal Investigating Body

WASHINGTON, D. C., April 10—Preliminary report and some statistics prsented today by congress by the Federal trade commission seems to leave the general public just as much in the dark as to what is causing the high price of gasoline as before the investigation was started.

Congress is told by the commission that for the purpose of bringing out the facts concerning alleged inequalities in the advance of prices in different sections, all statistics have been compiled and segregated by particular towns. Refiners and jobbers of gasoline have reported the location of their tank stations in every town having a population of 2,500 or over throughout the entire country and the quantity of gasoline sold at each point.

In its investigation the commission is considering both domestic and foreign conditions and asserts that it is weighing every factor to detect any artificial or manipulative element. A letter of inquiry has been sent to every manufacturer of motor vehicles, farm tractors, and other gasoline engines to ascertain as far as possible the increased outputs of their products and the effect of the advance in gasoline prices upon the demand for their machines and upon the consumption of gasoline.

Factors of Fuel Cost

The following points are being examined: Forces of demand and supply as effecting the price of crude oil, exports and imports, deterioration in quality of crude, increased cost of refining, improved methods, and speculative holdings of crude and gasoline.

It is pointed out that the close connection between the investigation of the causes of high prices and of the alleged discrimination should be noted. If prices are found to have been raised to higher levels in some sections than in others, after making due allowances for quality of product, freight and marketing conditions, it may be inferred that an element of artificial manipulation has entered into the advance.

The effect of decreased production in the Cushing field in gasoline terms is given in a footnote which says the gasoline content of oil from the Cushing fell from 96,000,000 gallons in April, 1915, to 36,000,000 in December, 1915. The gasoline content of all the oil produced in the United States decreased during the year. The estimate of the year's total gasoline content for all the oil in the country was 1,892,500,000 gallons.

Crude oil stocks increased during 1916 from 69,000,000 barrels in January, 1915, to 100,000,000 in January, 1916. Of this amount, refineries held about one-half the supply 1 year ago and not quite that percentage in January of this year, though they were holding some 8,000,000 barrels more last January than in January, 1915.

The Standard Oil companies, the tables show, produced about 60 per cent of the year's gasoline output. Their total was 681,750,000 gallons and that of the independents 400,000,000 in round figures.

Gasoline stock held by refineries decreased steadily from last May, when the total is put at 292,000,000 gallons, to December, 1915, with a total of only 152,000,000 gallons. Stocks increased from the first of the year to May.

Price ranges show that the amount charged by the independents averages about 1 cent higher than Standard Oil prices.

GOVERNMENT-MADE GAS NEXT?

Washington, D. C., April 10—Representative Warren Worth Bailey, Johnstown, Pa., is out with the latest plan for solving the price of gasoline problem as far as members of congress are concerned, his plan being to have the federal government at once enter the producing field. Mr. Bailey's bill authorizes and empowers the Secretary of the Interior to sink herewith wells on property owned by the government wherever advisable, with a view to producing oil, and also authorizes the Secretary of the Interior promptly to put the product on the open market, giving preference in selling to independent refiners.

Mr. Bailey states the Secretary of the Interior already has authority, under certain conditions, to enter into contract with private concerns for the refinement of the crude oil produced on lands included in the public domain.

GASOLINE PRICES OF WEEK STEADY

New York, April 10—The price of gasoline remains steady in the East, the Standard Oil, Texas, Gulf, and Crew-Levick companies all quoting 24 cents, tank wagon basis, in New York, and 23 cents in New Jersey, which have been the prevailing rates for several weeks.

In Portland, Ore., however, a price record has been smashed, the Standard Oil Co. advancing the price to 19½ cents. Naphtha and distillate also advanced 1 cent to 19½ cents and 10 cents respectively, in barrel lots. In Los Angeles gasoline has been advanced 1 cent to 19 cents.

The general impression among dealers seems to be that no further advance will be made in the immediate future, but that there will be a slight drop which may perhaps be followed by a further increase.

During the week gone by one new company entered the field, the Peoples Engine Products Co., being formed in Dover, Del., with capital of $4,000,000.

In Pittsburgh drastic action has been taken by the Pittsburgh Automobile Dealers' Association. This body has agreed to purchase no more gasoline from the Standard Oil Co. until its prices are justified to the satisfaction of members. Furthermore, all purchasers of cars in that city have been requested to refrain from purchasing from the Standard Oil Co. until prices come down to a normal level.

GAS PARADOX IN DETROIT

Detroit, Mich., April 8—There is a rather strange situation here with regards to the gasoline situation, for while the Standard Oil gasoline is being sold at 19 cents a gallon the independent oil companies charge 22 cents a gallon. Officials of the latter concerns say that they cannot sell at a lower figure unless it be at a loss, while at the price charged by the Standard company it is claimed that this concern is making a big profit. The claim also is made that were it not for the tremendous amount of gasoline the Standard Oil Co. sells to Europe, at large profits, it would not be possible for it to sell its gasoline here in the country at 19 cents or even at 20 without a loss. Independent officials claim that the Standard is trying to crush its rivals.

FUELS DISCUSSED BY A. S. M. E.

New York, April 11—At the spring meeting at the American Society of Mechanical Engineers, which opened today and will continue through until Thursday night, a paper was presented by Spencer Miller on organizing for industrial preparedness. Among other points which he made were fuels for internal combustion engines and good roads and bridges. He pointed out that aside from the needs of war there is a growing demand for liquid fuels for motor car and aeroplane engines. He suggested that an interesting and profitable inquiry might be directed toward securing other fuels and gasoline, such as green alcohol from sawdust and other wood wastes, sugar house waste and cornstalks.

As to good roads and bridges, he intimated that state directors would be an influence in every state if they urged the military value of good roads, especially along and near tidewater. He also pointed out that it should not be forgotten bridges should be made strong enough for heavy motor trucks and extra heavy cannon.

Tire Factory in South

Harold O. Smith, Retired President of Premier Firm, Back of Project

North Carolina Enterprise Incorporates with $500,000 Capital

CHARLOTTE, N. C., April 7—The J. & D. Tire & Rubber Co. was organized here today for the manufacture of pneumatic tires for motor cars. Harold O. Smith is president of the organization. He started in the rubber business in 1893 as one of the founders of the Indianapolis Rubber Co., which concern later became the G. & J. Tire Co., of Indianapolis, of which Mr. Smith was president. Mr. Smith was in the tire business approximately 13 years, until 1906, when he formed the Premier Motor Car Co., of Indianapolis. He was president of this company 1 year ago.

The J. & D. Tire & Rubber Co. has been capitalized for $500,000 and will manufacture only one grade of pneumatic tire, which will be built in all the necessary tire sizes. It is expected that the trade name for these goods will be J. & D. Production will be started by July. This is possible, as Mr. Smith obtained options on tire machinery last October. Already plans have been drawn up for the erection of a new factory in this city and work has commenced.

To facilitate selling arrangements some of the largest distributing interests in the country have been taken into the organization so that J. & D. tires will be sold largely to the company's own organization. Associated with Mr. Smith are Thomas J. Northway, Rochester, N. Y., vice-president; L. A. Falger, Charlotte, N. C., secretary; C. C. Coddington, Charlotte, N. C., treasurer; Harry S. Leyman, Cincinnati, O.; D. H. McColough, and E. Thomonson, directors.

NEW TIRE COMPANIES ENTER FIELD

Chicago, April 10—Two new companies announced their intention to engage in the manufacture of tires, a third company, which was incorporated recently in Maryland, made public its plans for a new factory, and another tire company purchased a factory site in Wichita, Kan., during the week just closed. Other tire manufacturers announced important building activities in the way of factory additions.

The Baltimore Rubber Tire Mfg. Co., organized recently under the laws of Maryland, has acquired a plant and will be ready to introduce its product upon the market about July 1. The plant will be located at Orangeville, Md., the former home of the Maryland Mantle Tile Co. The new owners took possession April 1. The company is incorporated for $200,000, all common.

The Perfection Tire & Motor Co., Ltd., has been incorporated at Toronto, Ont., with capital stock of $1,000,000. The incorporators include Charles F. Cole, president of the Champion Auto Equipment Co., Chicago; Elwood A. Stickelman and Larkin A. Rockwell, both of Chicago.

Reports from Akron, O., of large additions to the plant of the Firestone Tire & Rubber Co. to take care of an exclusive tire contract with the Ford Motor Co. were confirmed a few days ago.

The Goodyear Tire & Rubber Co., Akron, O., and one of its allied industries, are preparing to establish branches in Canada. Arrangements have been completed whereby the Goodyear plant will be located at New Toronto, Ont.

OFFER PERLMAN RIM STOCK

New York, April 10—Stock of the $10,000,000 Perlman Rim Corp., recently organized here to manufacture the Perlman demountable rim, is to be offered to the public. Subscriptions to the underwriting of 50,000 shares, no par value, out of 100,000 shares of the Perlman corporation, are being received by J. S. Bache & Co. at $120 a share. Underwriters will have the privilege of withdrawing half of their stock, which must be withheld from sale for six months.

Only $5,000,000 of the $10,000,000 stock is being offered to the public for subscription, the remaining $5,000,000 being retained by Messrs. Kaufman, Durant and Perlman, who jointly own the entire amount. Mr. Perlman is president and Christian Girl is vice-president.

LOZIER FOUR UP $100

Cleveland, O., April 10—After April 15 the Lozier four will sell for $1,695, instead of $1,595, as at present, but the price of the six-cylinder model will not be changed. The increase in the price of the four is due to the advance in cost of materials, which is affecting a great many of the other manufacturers at present.

AUBURN 6-38 AT HIGHER PRICE

Auburn, Ind., April 8—The Auburn Automobile Co. has advanced the list price of its model 6-38 from $1,050 to $1,085. The change was made effective April 1. Model 4-36, selling at $895, and model 6-40A, selling at $1,375, remain the same for the present.

CUMMINGS-MONITOR RAISED

Columbus, O., April 10—The Cummings-Monitor Co. announces a raise in price of its six-cylinder model N and a change in motors. The new price is $995, presenting an increase of $100, and the motor now used is a Continental model 7W, 3¼ by 4½, whereas the motor previously used was a 3 by 5.

Boston License Muddle

Car Used in Commercial Duty Cannot Be Driven on Sunday

Legislature Kills Bill to Sell Sunday Fuel to Motorists

BOSTON, Mass., April 8—Motorists who have cars which they use for business 6 days in the week and for touring on Sunday, now are faced with a problem, if the action of the Cambridge police is followed generally throughout the Bay State. Last Sunday, a man who used a Ford runabout in his business as a plumber on week days was motoring through Cambridge when he was stopped by a policeman, who looked over his car and noted the registration number with B in front. That indicated that it was a commercial vehicle. The policeman told the man that he had no right to drive his car on Sunday, because it was not a passenger vehicle.

When Chairman W. D. Sohier, of the Massachusetts highway commission, was asked about it, he said that he did not know any law that prohibited a man using his car on Sunday. In looking over the motor law he said there was a clause in the registration fee section that might apply to such cases. It says, "for the registration of every commercial vehicle used solely as such." Under the last four words it might be possible for a judge to say taht the car did not have proper registration, for it was not a passenger vehicle on Sundays any more than on week days.

No Gas on Sunday

To make conditions all the worse the state senate has just killed the bill allowing garages to sell gasoline, or other supplies like a tire, tube, etc., or make an emergency repair on Sunday. So now if a motorist runs out of fuel, or has a puncture and is without an extra shoe or tube, it is illegal anywhere in the state to sell him anything until after midnight Sunday, or to repair a break in his machine.

The reason advanced by some of the senators for killing the bill was that it would mean garages keeping open 7 days a week, or having a lot of alleged garages opened up for Sunday business only. But as the city and town authorities grant the permits for garages that could be checked.

The Cambridge police officials, when asked about their attitude, said that it was illegal to use vehicles with business registrations on Sunday, and that they had warned owners not to do it. That means the police are beginning a campaign with the approach of summer. In the warm weather there are scores of trucks used on Sunday to take men and women on picnics.

Motor Car Production in 1916 Goes Up 400 Per Cent

Factories Build 566,442 Machines in 3 Months—In Same Period 1 Year Ago, Number Was 106,000

DETROIT, April 8—For the first quarter of this year, Detroit motor car manufacturers produced 238,076 vehicles, including passenger cars, commercial types and electrics. Outside of Detroit, but still in the large production area in the vicinity, other big makers swelled the total to 328,366. The Willys-Overland Co., Toledo, was the largest contributor to the totals with the exception of Ford, of course. The last figure named includes the output of factories in the cities of Toledo, Lansing, Jackson and Flint, in addition to Detroit.

On the above basis, there seems no doubt at all that the motor car industry as a whole this year will build cars to a total far over 1,000,000. The entire output of all the car building plants in the United States for the first 3 months of 1915 was approximately 106,000 machines, hence even the number built by Detroit plants for the first quarter this year is over twice that of last year for the entire industry. Add the production of the factories scattered in other parts of the country to the totals for Detroit, Mich., and Toledo, and it would appear that the combined output for the first part of this year is nearly four times that of 1915.

Factory Records Tell the Tale

This jump of nearly 400 per cent would be almost unbelievable were it not for the specific production figures of some of the enormous producers such as Ford, Overland, Buick, Studebaker, Maxwell, Chevrolet, Reo, Saxon, Cadillac, etc.

Ford's production for the first three months set a new record for even that great factory, for a total of 149,005 Ford model T's were turned out. This total was made up of 44,365 in January, 46,311 in February and 58,329 in March. The latter month was the greatest in Ford history, and is about 15,000 better than March, 1915. No one doubts now that Ford will attain the 500,000 mark set for the present fiscal year, nor that the 1917 output will reach a million as predicted by the Ford officials.

January, February and March resulted in the building of 47,465 Overland machines, as compared with 17,245 for the first quarter of 1915. This wonderful increase has resulted from the adding of several enormous structures to the mammoth Toledo works. How the total was attained is indicated by the comparative figures for each of the 3 months for the 2 years:

OVERLAND OUTPUT FIRST QUARTER

	1915	1916
January	4,613	12,393
February	5,627	15,292
March	7,005	19,780
Total	17,245	47,465

Many other factories have shown proportionate increases. Take the Saxon, for instance. All eyes have been on this youngster which in such a short time has had a most remarkable career. Last year's first quarter showed a combined production of 2,591 Saxons, but for the present quarter 6,391 machines carried the Saxon name to all parts of the country and abroad. March just passed resulted in the building of 2,604 Saxons, thus exceeding in the month the record of the first 3 months of 1915.

Everywhere you go you are met with information of stupendous growth in production among the larger companies. Studebaker indicates an increase of 100 per cent over last year's first quarter. Packard tells you that its production has stepped up 300 per cent; Cadillac has shipped 26,563 eights since it started to make them, a wonderful showing for a high-priced car, as prices are reckoned these days. There are some 400 Cadillacs awaiting shipment now, and they would have been on the road long ago had there been freight cars in which to ship them.

Reo has been enjoying a wonderful growth in Lansing, and shows greatly increased output. Oakland states that its production is 400 per cent better than for the first quarter of 1915. March showed the best record for manufacture and shipment of cars in the history of the Paige-Detroit Motor Car Co., production facilities having been increased to 175 cars a day. Maxwell is making over 300 cars a day now, and is attaining a monthly output of about 8,000.

If it were possible to divulge the actual figures in all of these cases, the public would be astounded at the success practically all are having. The above, however, will give a good indication of the great advance of the industry.

When you consider that a number of things of a more than passing seriousness have been confronting the makers this year, the results are all the more astonishing. Never has the tie-up of freight cars been so acute; never in the history of the business have raw materials been higher nor more difficult to obtain; gasoline is rising; prices in a great many instances have had to be raised on the cars as a result of materials conditions; labor of the right kind is scarce.

Although the National Automobile Chamber of Commerce reports no betterment of the freight car situation, there are some who feel a bit easier over it, although nothing very beneficial has developed. The removal of certain embargoes to points in the east has helped somewhat, and with spring coming on, it seems likely that the congestion will be bettered automatically.

March was the record shipping month so far in the history of the industry, as must naturally follow from the figures given above, 28,600 carloads being shipped by the American motor car manufacturers. This is practically 5,000 carloads more than for February this year. As the weather gets better and roads become harder, there will be an increasing number of cars driven over the roads from the factories by the dealers. This, of course, applies to points not too far removed from the factories, but at the same time it is a factor for reducing the car shortage. Already this year, more automobiles have been driven overland than ever before.

Who Is to Blame for Defective Parts?

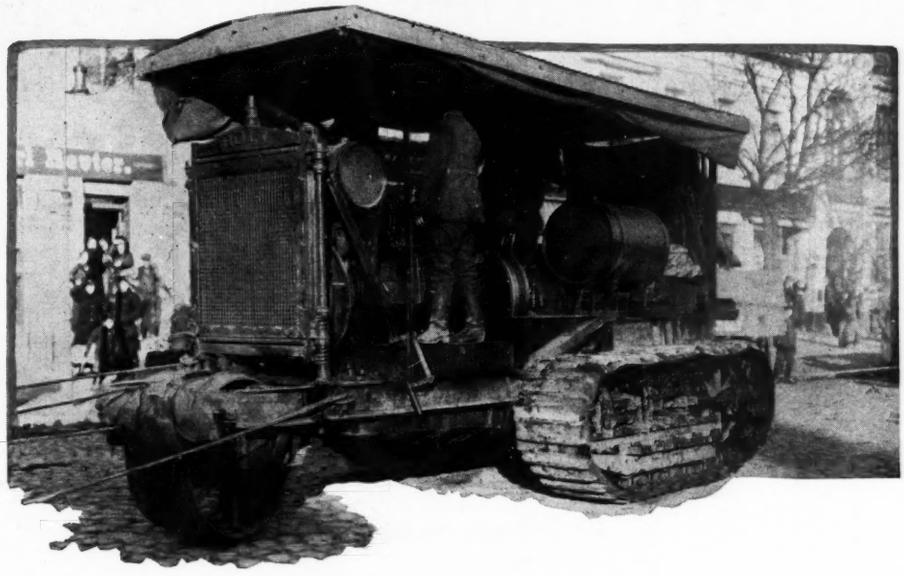
New York Court Holds Car Maker Is Responsible

NEW YORK, April 10—According to a recent decision of the Court of Appeals in New York state, a motor car manufacturer is liable to damages if the material in his car proves defective. In a recent case, an owner driving on the highway was thrown out of his car when one of the road wheels collapsed. It was established on examination that the wood in the wheel spokes was defective, and that the accident was directly due to this cause. The motor car manufacturer did not make the wheel, but had purchased it from a reputable wheel manufacturer who had previously sold over 80,000 wheels to the same motor car manufacturer. The court held that the evidence showed that the defect could have been discovered if the wheel had been properly inspected by the motor car manufacturer, and further, that such inspection had not been made.

In view of this decision in New York state, the burden of responsibility for defective material has been apparently established. Under this decision the question of defective parts in assembled cars will naturally rest with the manufacturer who assembles these into the complete machine. Up to this time it has been a point of question as to how far the manufacturer's liability for damage to personal property, due to defective parts, goes, but the present case has established a precedent.

What Motor Cars Have Done for Warring Nations of Europe

Without Them the Results Shown by Either Side Would Have Been Far Different, According to Authorities



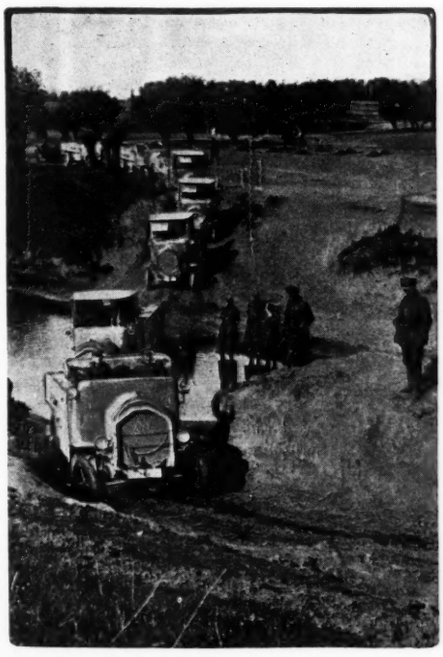
BERLIN, April 1—According to enthusiastic Germans, three factors were responsible for the successes of the kaiser's armies in Poland—Von Hindenberg, the big guns and the motor car. While a choice between these three would be difficult, it is admitted that the field marshal could hardly have been so successful had he not had the motor vehicle to assist him.

Movement of troops and ammunition over roads that were bad and through sections where there were no roads gave motor equipment a severe test, but it stood the gaff in surprising style. Through snow and mud, over railroad rights of way and elsewhere cars and trucks were driven under conditions that no ordinary use of them would have been attempted.

Work on West Front

It stands to reason that cars served all kinds of work for which they never had been intended. The writer remembers, as specially striking, the instance of a car jacked up with its rear axle geared to the generator of a wireless telegraph outfit, and another case, where the motor actuated the dynamo of a huge searchlight. One of the most interesting emergency uses to which a car was put was when the motor of one of the large siege guns bombarding one of the Russian fortresses became inoperative. In a very short time the crankshaft of a nearby car had been geared up to the shaft driving the electric motor of the gun and controlling the position of the latter, so that the gun could continue to operate until a thorough repair could be made.

On the western front, motor cars also found plenty of work. This applies especially to the fighting in the Champagne and Vosges, where the net of railroads is more sparse than in Northern France and Flanders, and where at times most violent fighting went on. Several hills commanding the surrounding ground, such as the well-known Hartmannsweilerkopf, changed hands as many as a score of times during the war, and the party on the offensive of course had to bring up troops and fighting machines under better cover than that of the strategic emergency railroads serving a position which is securely held. In more than one case, all the fighting against the forces on such a hill was in vain, until the supply of heavy ammunition was cut off from them, when the position was carried by storm. In some of these storms, armored cars with small-calibre guns partieipated, and in spite of the obvious difficulties of such a hill climb made surprisingly good showings.



Above, a caterpillar trailer captured from the Russians. Below, German motor corps in Russian Poland, hitting some rough roads

One might even say that Germany succeeded where motor cars could operate and did not succeed where they failed. Wherever there was a possibility of quickly attaining a position required and suitable for effective attack, this possibility was realized through the work of the motor vehicle. It was the alliance with the motor car which made the 30.5 and 42 centimeter guns as effective as they proved in scores of siege operations, including Liege, Antwerp, Maubeuge, etc.

Steering Gears Weak

Mention already has been made of Factories Behind the Front, as the repair shops are called. In the east these shops, of which there are a number, are from 150 to 200 kilometers behind the front, while in the west they are much closer to it and in better communication therewith. The chief reason for this different situation is that the positions in France and Belgium are considered by the invaders to be absolutely impregnable; to support this argument they point to several gigantic attacks which left the German front almost unchanged and which were stayed by an army of much smaller number than those attacking the lines of the Teutons. Needless to say that motor cars played their part in these very efficient defense acts, transferring reserves and materials from one point to the other, according to local requirements.

As to the technical information which the war work of the motor car brought to

German motor corps in Serbia. Here the motorized equipment went a long way toward achieving victory for the kaiser's forces

the light, one of the most striking facts discovered was the general weakness, relatively speaking, of the steering gear. The steering equipment seemed most apt to give way under the terrible stress of operation.

One trouble much complained of is the lack of protection of the radiator. The slightest injury of the honeycomb developed very quickly into serious trouble since motors are always working at top capacity. Whenever possible, radiators are being protected by cheap but strong devices, such as wide-mesh, heavy-wire hoods. It is said that German trucks, constructed with a view to getting government subsidies for their purchasers, were better protected from the start than American trucks, which latter proved excellent in a great many respects. The Germans frequently praise the relatively low weight of American machines which permits greater fuel economy, a most important factor in Germany today. In this respect, American cars average much better than European makes.

Children of the War

INVENTIVE Germany, under the stern hand of Mars, has developed new formulas and designs in connection with the operation of its motors that is bound to get recognition, once the bloody struggle is over and the war-ridden countries again turn to their commercial channels. Three things that are directly the result of necessity, brought about by the war, are these:

Germany is making practically all of the tires used in the empire. It does not depend upon importations of para rubber, either, but makes its own rubber by a synthetic process. This material bids fair to be a strong competitor of natural rubber.

Motors have been designed to operate with alcohol and benzol. Let no one be surprised if after the war Germany uses no gasoline for its motors.

German metallurgists have a process for making an alloy composed mostly of aluminum, to which is added a metalloid element, the mixture closely resembling steel in its elastic possibilities.

An army officer's touring car leaving divisional headquarters over flooded roads

Another point which had not been foreseen sufficiently was ground clearance. Motor cars had, of course, to make their way over the most unimaginable ground and many a car was delayed for hours or, worse yet, disabled for weeks. Here, too, light and cheap American products gained laurels.

With the natural irregularity of supplies that accompanies war operations no matter how well managed, maximum carrying capacity for fuel and oil is of paramount importance. The tanks, however, proved almost invariably to be hardly sufficient. Hence, whenever motor cars go to repair shops, small tanks are replaced by large ones, which latter are generally of aluminum, iron and copper being too costly for this kind of equipment at present.

Aluminum in Demand

Apropos of the increasing use of aluminum, there is a very noticeable tendency toward a reduction of dead weight in German motor car construction. Alloys of the nature of magnalium, a combination of aluminum and magnesium, which is both light and strong, are becoming very common, and German engineers and metallurgists do not tire of emphasizing the great help which the war rendered to their work by forcing the rapid development of many questions of this kind. There exist a great many new articles which enter into the manufacture of car parts, and several developments of paramount importance are said to be in the status nascendi. One of these, it is rumored, is an alloy composed mainly of aluminum to which has been added a metalloid element, and the mixture is said closely to resemble steel in its elastic possibilities.

Another novelty, or rather a series of innovations, exists in the fuel line. Let no one be surprised if after the war Germany will use almost no gasoline for her motors. Not only has the use of benzol increased tremendously, but alcohol has be-

come at least as common for motor service, and the very design of motors has been adapted to the character of these novel fuels.

Synthetic Rubber Used

It has been mentioned that synthetic rubber now is a practical article in Germany. Seeing that Germany's imports in this very valuable and important substance, namely, para rubber, became practically nil with the outbreak of the war, the plans for making the material in a synthetic way were rapidly put on a commercial basis, and almost all new tires now are made of this material. Germans have no doubt that after the war they will soon increase their output of synthetic rubber and that they will be able to do so at such a low price as to introduce in a short time huge quantities of the material in the world. German technologists in particular are very optimistic regarding this development and more than one has been heard by the writer to predict for the rubber industry the same fate that befell the indigo industry decades ago, when synthetic indigo was first brought out by the Germans and in a short time destroyed completely the trade in the natural East Indian product.

This incident, of which there are a considerable number of parallels, points to an important evolution in German industry. Until a short time ago, the empire recognized what was known as secret patents, claims and specifications to inventions, which were filed by the government, but not published, yet protected the inventors' rights. Only the growing power of liberal business interests disposed in time of this rather undemocratic institution, but Germans now believe that the war will be followed by commercial competition so keen as almost to amount to a trade war against Great Britain and possibly America, and they will do their utmost to protect national business interests, even at the expense of some free institutions. It is to be supposed that, if these plans realize, the Germans will offer to the world after the war numerous new chemical products the compositions of which, of course, will be determinable by analyses, while the process of manufacture will be kept utterly secret.

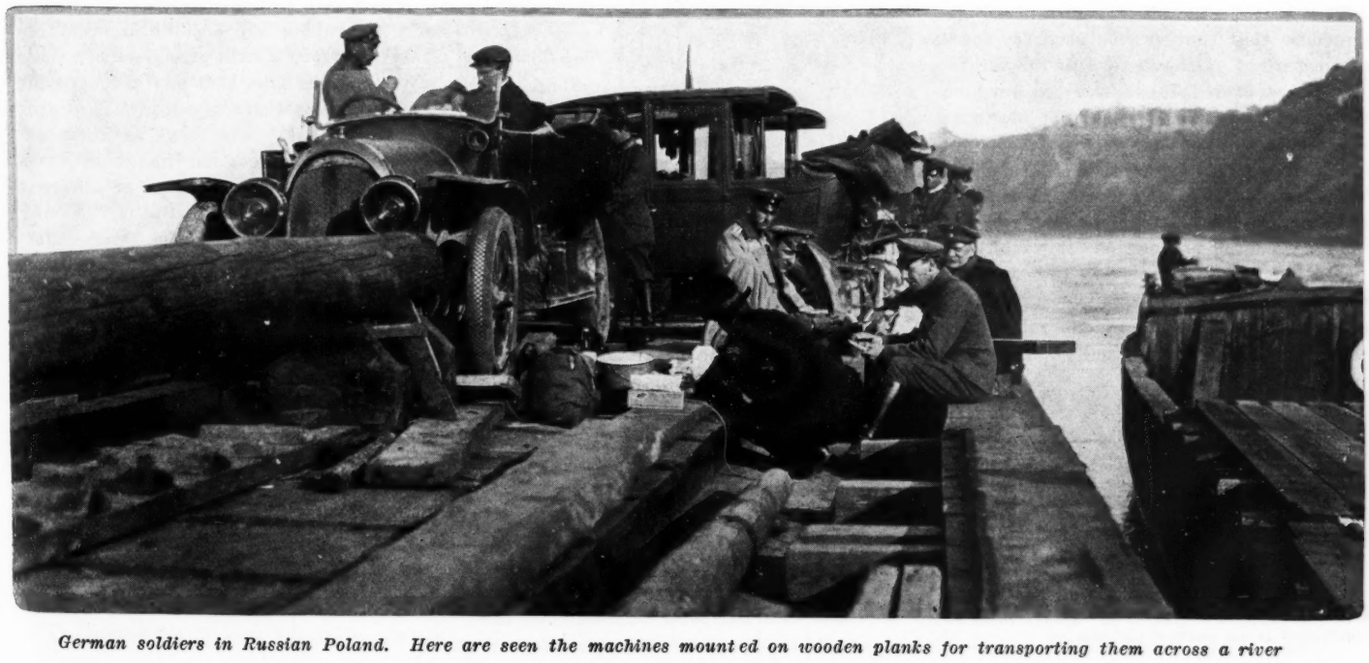
Germans in southeastern theater of war—Serbia—unloading provisions

Germany Adopts Production

It may not be amiss to state that plans are under way for the organization of one or perhaps even several enormous motor manufacturing corporations which are to produce cars on the myriad basis as it exists in the American industry. Germans thereby not only expect to curb the imports of American-made cars, which steadily increased during the 6 or 8 years before the war, but they intend, in course of time, to become the chief power of supply for the international motor car market. For this, Germans state, they are indebted to the lesson Americans gave them during this war by exporting countless motor vehicles to Europe. Germany seems to believe that sooner or later there will be a chance for her also to determine history by purely commercial methods.

One more fact should not be forgotten in this connection. About 1 years ago, it looked as if the coming of peace would bring in time a wonderful chance for American industry exporting its products to Germany and the countries of her allies. For months, however, negotiations have been under way between these powers to complete, with the re-establishment of peace, a customs union, enabling them to buy industrial products from German and Austrian industry and to obtain agricultural products cheaply from the Balkans. Germans are inclined to believe that such a combination could soon be extended to include Italy and Scandinavia; and if these plans materialize only to the extent of one-half their scope, this will mean a huge obstacle in the way of any American industry figuring upon exporting to Central Europe after the war.

With peace expected in England by the end of the year, and in Germany considerably before that time, it is very important that Americans be prepared for the opportunities which the end of the war will bring. If rightly handled, these should be very profitable.



German soldiers in Russian Poland. Here are seen the machines mounted on wooden planks for transporting them across a river

Tires, Their Care and Repair—Part II, Vulcanizing

Instructions in the Repair of Small Cuts in Casings

How to Fix Punctured Tubes on the Road

Herewith is printed the second installment of a series on the care and repair of tires, the first of which appeared in the April 6th issue of Motor Age. The present installment explains in detail the methods to be pursued by the owner in vulcanizing his tires whether it be on the road or at home. Portable vulcanizers are dealt with in this installment. The more elaborate vulcanizing outfits for permanent installation in a garage will be taken up later.

THE two most common causes for the failure of tires luckily are the two most easily prevented. One of these is under-inflation and the other is the neglect of small cuts in the tread that admit dirt and water, rot the fabric and ultimately cause blowouts.

It is unlikely that anyone will deny that under-inflation of tires is a condition that can be prevented by watchfulness on the part of the driver. It is just as true that small tread cuts can be remedied before they seriously damage the life of the casing, even though they cannot be prevented. A pump and reliable tire gauge will keep tires up to the pressure recommended by the tire manufacturers. A portable vulcanizer will seal the tread cuts permanently and quickly if promptly and properly applied. It is the intention in this article to explain how portable vulcanizers are used, not only in the repair of small cuts in casings, but also in mending of tubes.

Most of the portable vulcanizers are designed so that they can be used for roadside repair of casings and also for the repair of punctured tubes and those which have sustained small rips, from blowouts or rim cutting. Many of these are equipped with a flat plate on both sides, for use with the tube, and with a concave plate on the other for vulcanizing casings.

As a general proposition, it usually is considered better economy in the long run to carry a vulcanizer which is capable of both types of work, for though tubes only need attention when actually punctured, without delay—on the road, if necessary—have been of sufficient importance to parrant many thousands of motorists in investing in vulcanizers which are capable of tube work only. However, when it is considered that casing repairs can be made just as quickly and usually without extra bother, because they are done while other work is being done about the car, the advantage of being able to mend casings as well as tubes is evident.

Vulcanizing as applied to the care of tires may be defined as the heating of raw rubber. When the raw rubber, of a consistency somewhat like chewing gum, is heated to the proper temperature and held firmly against the cured rubber of the tire, the result is a permanent union of the old and new rubber. The joint or weld becomes as strong as the tire itself.

It is evident then that any arrangement which will simultaneously apply the proper pressure and heat will serve as a vulcanizer. This consideration has made possible the success of a number of different types of vulcanizing apparatus. Among the portable vulcanizers, the chief differences arise in the methods of producing and applying the necessary heat.

One of the most widely used types, because it has proven satisfactory in practice, and is both inexpensive in first cost and operation and also easy to operate, is the simplest type of direct gasoline vulcanizer. This consists simply of a plate carrying a well for gasoline with spines in the well which conduct the heat of the gasoline to the face of the plate and thence to the rubber.

A measured quantity of gasoline is poured into the well, ignited and allowed to burn until the fuel is exhausted. The vulcanized repairs in tubes are the only ones that can be relied on to be permanent. Patches make satisfactory emergency repairs, but are likely to come loose in continued service, particularly in warm weather.

The saving in expense and the convenience of being able to vulcanize one's tube

STEPS IN VULCANIZING A TREAD

First, clean with gasoline; second, scrape out dirt and again clean; third, apply cement; fourth, press in raw gum and trim off excess; fifth, apply vulcanizer with wax paper beneath. The one illustrated is an electric instrument

STEPS IN VULCANIZING A HOLE IN A TUBE

First, trim the hole as in the second view from the left, then clean thoroughly with gasoline on rag or brush and roughen; second, apply cement; third, apply patch and vulcanize as in the right-hand illustration

heat thus generated serves to vulcanize the tire. The only objections to this open type of gasoline vulcanizer are that the flame is exposed so that it may blow out in the wind and the exposed flame may sometimes be dangerous in a closed garage or where gasoline fumes are present.

Another type is the inclosed direct gasoline type in which that fuel or alcohol is burned inside of the vulcanizer, the flame being completely protected from the wind and to a certain extent protected from coming in contact with any gasoline vapors that may be about. It is probable also that a less quantity of gasoline is needed and consequently less time required for the operation in this type.

Recently, there has appeared on the market a very compact type which does not use gasoline, but uses a fuel wafer. The steam type is designed to give a more even heat and simply uses gasoline or other fuels to produce steam by which the heat is conducted to the plate next to the tire.

Electric vulcanizers have found much favor with motorists and these can be obtained either for voltages which permit them to be attached to the lighting wires in the house or garage or can be secured in voltages which adapt them for attachment to the storage battery. This latter type permit of use in roadside repairs away from other source of current.

Operation Is Simple

No matter what the type of vulcanizer is, the actual operation of repairing cuts in tubes and casings is practically the same. The only difference comes in the actual application of the heat.

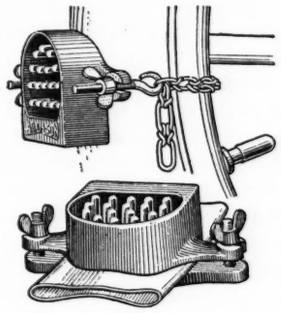
The sealing of small tire cuts is a very simple series of operations that require a comparatively short time. But it does require that care be taken in the preparation of the cut before vulcanizing.

For repairing cuts in casings there is very little needed in the way of special equipment aside from vulcanizers. The outfit is as follows:

Raw gum, or repair rubber.
Vulcanizing cement.
Wax paper.
Tire talc.
Thin-bladed pocket-knife.
Small screwdriver.
Small bottle of gasoline.
Roll of repair gum.
Small pair of scissors.
Some waste and a soft cloth.

Repairing Cuts in Casings

It is not necessary to take the tire off the wheel; the work can be done with the tire inflated. Jack up the wheel. If you are in a garage, sit on a stool in front of the tire, revolve the wheel slowly, the top towards you, and closely examine the surface of the tire for cuts. If the tire is dirty, wash the surface with soap and water and dry it off with waste. When you come to a mark which has the appearance of being cut, take the knife and carefully probe it. Very often you will find beneath the surface of the tire a sharp stone, a small piece of glass, or metal.



USE OF OPEN GASOLINE TYPE

Showing how the vulcanizer is used for repairing casings and tubes

Remove the offending foreign matter and scrape around the cut until there is smooth rubber or fabric around the entire injury. Wash it out thoroughly with gasoline. This can be done with a rag dipped in gasoline and wrapped around a blunt nail or a screwdriver. And if the fabric is exposed, it should be scraped and washed until all the rubber is removed. The whole interior of the cut must be thoroughly cleaned in order to give a good surface for the repair gum to take hold.

After the roughening and scraping process is completed, spread a coating of vulcanizing cement over the inside of the hole and allow it to dry for several minutes until it becomes "tacky," that is, sticks firmly to the fingers. The purpose of the cement is to fill the crevices in the rubber and fabric to insure a perfect adhesion of the new rubber to the old rubber of the tire. The cement can be applied with a clean nail or stick or a small screwdriver. It is well to know when using a screwdriver for this purpose that gasoline is a very good solvent of the cement for cleaning tools and hands.

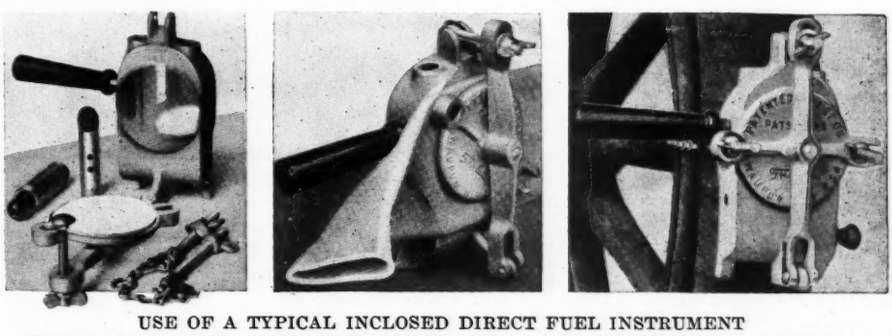
The length of time necessary for the cement to dry depends on the cement used.

Applying the Rubber

If the cut is a long one, that has taken off considerable length in the tread, a piece of repair gum is cut to the same shape as the piece torn off, or if it is a small cut merely to be filled, a small piece of repair gum is inserted in the cut. The pieces of raw rubber do not need to be cut to fit the hole in small cuts, as when heated under the pressure of the vulcanizer the new rubber flows as freely as molasses for a few moments before it hardens to the same consistency of the tire. A nail or a screwdriver can be used for pressing the raw rubber into place. The latter should be pressed in firmly to exclude air bubbles which might make the repair come loose.

The cut should be almost filled, but not quite, perhaps to $\frac{1}{16}$ to $\frac{1}{32}$ inch below the surface. If it is filled too full the repair is liable to stick up beyond the surface of the tire, where it will tear loose.

(Concluded on page 41)



USE OF A TYPICAL INCLOSED DIRECT FUEL INSTRUMENT

The vulcanizer with its parts, the burner, the fuel measure, the tube plate and casing clamp, are shown at the left; in the center the instrument is applied to a tube; at the right, to a casing

Old National Pike Rejuvenated

(Continued from page 9)

lines southward to Winchester, at the head of the Shenandoah valley, one through the Antietam battlefield, Sharpsburg, Charles Town and Berryville, and the other through Williamsport and Martinsburg. Leading to the northeast is the equally important route to Waynesboro and Gettysburg; almost directly north the one to Greencastle and Chambersburg, and to the northwest the road through Cearfoss and Mercersburg to McConnellsburg, making a shortcut to Bedford and Pittsburg. Half northern, half southern, the meeting point of so many strategic roads, and especially with a convenient location in the Cumberland Valley of southern Pennsylvania, the district of which Hagerstown is the center was necessarily crossed and recrossed by both armies during the war between the states. But no engagements of importance took place in the immediate vicinity, the great military movements culminating at Antietam, 11 miles south, and at Gettysburg, 35 miles northeast.

The first few miles beyond Hagerstown are level or rolling, like those east of that city; but shortly after crossing the picturesque stone bridge over Conococheaque creek the summits of still greater mountains are seen. After passing through the little settlement of Clear Spring the tourist approaches Fairview mountain, and in doing so he may momentarily lose sight of the pass, wondering meanwhile if it is possible to make the ascent. Presently the way opens up, the road winding by an easy but constant grade to the top, at an elevation of 1,000 feet, a climb of 434 feet from Clear Spring. There is yet neither railroad nor trolley along the road in this section, though a motor stage, carrying passengers and light freight, makes two daily trips between Hagerstown and Hancock.

A Detour Recommended

Just beyond the west foot of Fairview mountain is the little hamlet of Indian Spring, the nearest point to old Fort Frederick, the best preserved of all the colonial forts in the United States, and well worth a detour of 5 miles to visit. While this is on a farm owned by Homer J. Kavanaugh, of Big Pool, motor tourists are welcome. Any who make the detour will be surprised at the extent of the old fortification, the height and width of the walls and other features about the place.

Fort Frederick was built in 1755, shortly after the tragic defeat of Gen. Edward Braddock and his army of English regulars, at the battle of the Monongahela in July, 1755. Emboldened by their success, as allies of the French, who had strongly established themselves at the present site of Pittsburgh, the Indians swept down mercilessly upon the unprotected frontiers of Pennsylvania, Maryland and Virginia, after wiping out the small settlements in the Alleghanies, and even threatening some of the towns east of the Blue Ridge mountains. Forts Cumberland and Frederick were erected to keep back these savage hordes, which their strong garrisons did very effectively for several years. Subsequently Fort Cumberland, being a valuable ground near the center of a growing city, was dismantled and its site put to other uses, while Fort Frederick, located out in the open country—and on ordinary farming land—has been kept in much the same condition it was in the French and Indian war.

Touring the Potomac Shore

The size of this old fort will especially impress anyone who has visited other colonial fortifications, several of which might be stored away within the walls of this one. Aside from the fort itself, there is had from the road some of the finest scenery along the Potomac, especially the big pool which gives the little village its name. This is a remarkable widening of the river until it somewhat resembles a long narrow lake, where canal boats or other craft may pass, tie up or find shelter in case of severe weather. Along this section the Potomac and the old Chesapeake and Ohio canal, which is still doing a considerable traffic in heavy freight, are practically the same, though a short distance away in either direction they follow nearly parallel but separate channels.

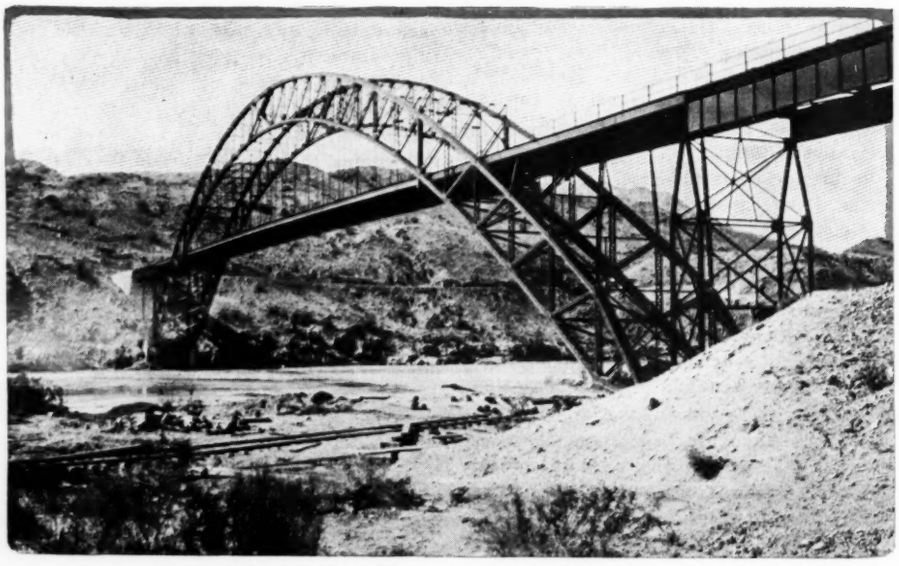
Returning to the pike again at Indian Spring, or going straight through without the detour to Fort Frederick, the road comes closer along the Potomac; and for the next 10 miles, to just beyond Hancock, where road and river part, there is a succession of wonderful landscapes, of which the one on page 000 is typical.

Sometimes the hills near the water's edge are almost as abrupt as the Palisades of the Hudson, the opening between the mountain ranges on either side being apparently wide enough only to allow free passage of the waters. Though the general aspect is about the same over this stretch, every angle furnishes a somewhat different and always fascinating view. Our road—and the two railroads since built along the route—are all obliged to accommodate themselves as well as possible to the topography. Looking to the left the tourist occasionally sees one or more old-fashioned canal boats, seeming slow as fate, and almost a relic of by-gone days.

In the fall of 1914 there was a considerable unfinished piece on this road along the Potomac in the vicinity of Millstone, Md.; but that was so nearly completed in the summer of 1915 that there is little risk in the statement that not a single mile of bad going will be found between Washington or Baltimore and Cumberland this year.

Hancock, the next town, is not only an important point on the road, but is the place to leave it for the interesting side-trip which crosses the Potomac by the long toll-bridge into West Virginia, and continues southwest about 6 miles to Berkeley Springs, which has been a famous health resort since Washington's day. Of

New Bridge Will Aid Old Trails Tourists



TOPOCK, Ariz., April 8—With a celebration in which several hundred people from Needles, Cal., and Kingman, Ariz., took part, the Topock bridge, which forms an important link in the National Old Trails highway, was dedicated last month. Heretofore Old Trails tourists have had their choice of two routes between Kingman and Needles—via Oatman and ferry across the Colorado, at $5 a car, or via Topock, at $3.50 for crossing the Santa Fe railroad bridge. The bridge is 700 feet long and cost $75,000, one-third of which was appropriated by the Arizona legislature, one-third by the California legislature, and the remainder by the national congress.

late years it has been somewhat eclipsed by Hot Springs and White Sulphur Springs, largely on account of their superior hotel accommodations. But a new hotel is projected, if not actually under way at Berkeley Springs, the opening of which will greatly increase the motor travel there, easily nine-tenths of it coming east or west over the old Pike to Hancock and southwest from there.

Meeting Real Mountains

From now on we shall be in the mountains almost constantly to Uniontown, Pa. The change is complete both from the levels of eastern Maryland and the rolling roads of the central part of the Old Line State. The first range west of Hancock is Tonoloway ridge, the climb along the eastern face of which lifts the tourist far above the levels of the Potomac, which from now on pursues a winding southerly course, and is not seen again on this trip until Cumberland is reached. Sideling hill, the next range west of Tonoloway ridge and the second in the gradual ascent from Hancock, reaches an elevation of 1,633 feet just before the principal curve on the summit, and is usually considered the most difficult on the entire route. Higher elevations than this will be found on some of the ridges farther west, but nowhere else between Baltimore and Wheeling is there an ascent of 760 feet in a mile and a half, as on the eastern slope of Sideling hill, or a descent of 495 feet in a single mile, as on its western slope.

The latter, which starts along a ledge just beyond the summit, should be coasted with the brake on lightly, not only on account of the grade, but especially to prepare for a sharp, almost horseshoe curve. Town Hill is crossed next and then Green ridge, on the western slope of which is an orchard of between 50,000 and 60,000 apple trees, one of the largest in the eastern states. These steep and rough hillsides have only to be cleared and cultivated to produce excellent crops as well as an abundance of fruit, though the necessity of hauling everything intended for market to one of the railway stations along the Potomac has been a considerable handicap. The owners of the great orchard on Green ridge have partially solved the problem by the purchase of several motor cars, which is surely a sign of progress.

Into Cumberland

A few miles west of Green ridge the road ascends and descends Polish mountain, coming along Flintstone creek and passing through Warrior's gap into the little mountain village of Flintstone, the last place with overnight accommodations east of Cumberland. Flintstone owes its very existence to the highway, even mail from points east being carried into Cumberland and brought out by motor stage. From now on, the pike, the river and the railroads gradually draw together until they meet at the busy little city a few miles farther west.

The tourist leaves Flintstone over a fine level stretch of somewhat more than 2 miles to a large stone house on the right, marking the intersection of the old Hancock road before the present highway was built. Immediately beyond the stone house begins the winding ascent of Martin mountain, the road rising 535 feet in a trifle over a mile. There are several curves and the surface is excellent. Over to the left, on the way up, one catches specially fine views of minor ridges and valleys, with suggestions of very small villages in the distance. Just over the summit, after coming down to an elevation of 1,720 feet again, there is a comparatively level stretch, followed by an easy descent of the western face by long stretches of state highway. If, as is quite likely, the motorist descending any of these ranges happens to meet a strong, four-horse team hauling up a load of lumber, coal or other heavy materials, he will better appreciate the grades than being carried over them in a motor car.

There are no more steep grades on this section of the trip, as the pike shortly comes along a small stream, which is followed with several crossings, to the small iron bridge over Evitt's creek. Just beyond, there is a parting of the ways for the balance of the trip into Cumberland. During 1915, the better route was by the first right-turn beyond the small iron bridge, directly across by an excellent road, cut in part through a hillside, to its end at the Bedford road. By taking this route the tourist can follow Bedford street, mostly on brick pavement, straight ahead to the business center of Cumberland.

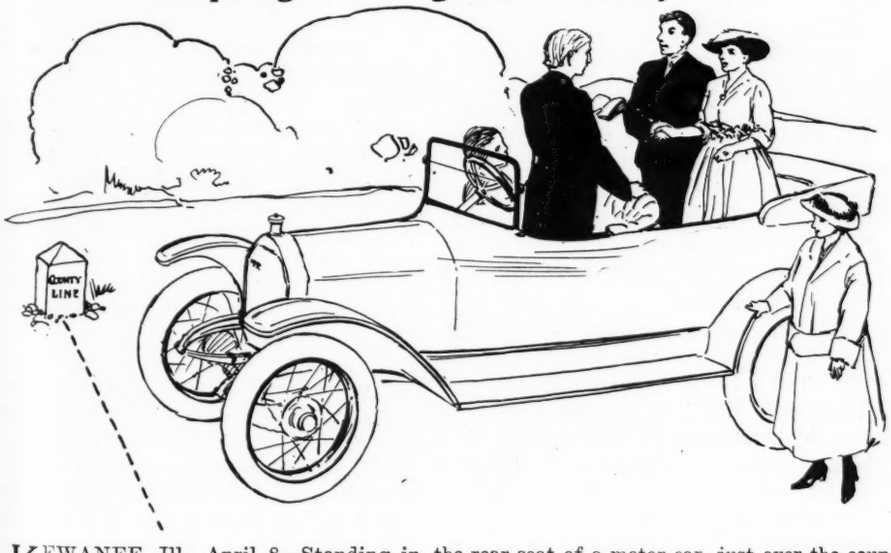
Overlooking the City

Following the old road, one curves around the edge of a small mountain at the outer edge of the city, passing a cemetary on the right, to begin at once a rather long, steady descent. Near Cumberland, one catches a glimpse of the wide-sweeping Potomac, pursuing its peaceful course between the frowning hills of Maryland and West Virginia; and after a brief but closer study of the topography, Cumberland is seen to be literally a hub of transportation by road and rail. It is also approximately half-way between Baltimore or Washington and Wheeling.

Though by constant running, the 140 miles or so from Baltimore or Washington to Cumberland can be covered in half a day, even across the several mountain ranges, it is much better, especially for the first-time visitor, to allow a full day for it, with a noon stop most conveniently at Hagerstown, which will enable the party to look up the principal points of interest immediately along the highway, and in most cases include the Fort Frederick detour as well.

Those who made this trip 3 or more years ago will be glad to note that all of the old rough and stony stretches have been replaced by Maryland state road, which is kept in excellent condition. The average running time has been cut in two, at least, and the former tire wear lessened by fully three-fourths, while the pleasure of the trip has been multiplied many times. Equally pleasant surprises are in store on the section from Cumberland through Uniontown to Wheeling, which will be the subject of the succeeding article.

"In Spring a Young Man's Fancy——"



KEWANEE, Ill., April 8—Standing in the rear seat of a motor car, just over the county line between Kewanee and Neponset, George Crist, of Kewanee, and Miss Blanche Robinson, of Buda, were married by the Rev. J. E. Edwards, pastor of the Methodist Episcopal church of Kewanee. The unique wedding was necessitated by a mixup in the license. The principals appeared at the parsonage of the pastor and presented a license issued in Bureau county, while the clergyman resided in Henry county. It was necessary to make the trip to the former county in a machine. As soon as the car was over the line, the ceremony was performed and the party returned to Kewanee.

Are You Getting Proper Lubrication? How It Is Done

Fundamental Principles of Motor Oiling and How to Overcome Evils of Poor Lubricants

By Herbert S. Holder

IF the engine in your car has run for a long period of time, using a certain brand of lubricating oil without giving trouble, you can feel certain of two things, first, that it is a well-designed engine, and second, that it is using a good lubricating oil. Otherwise, trouble would occur.

If trouble occurs in an engine, however, we are confronted with several possibilities.

First—The lubrication system is of poor design.

Second—The oil is poorly refined.

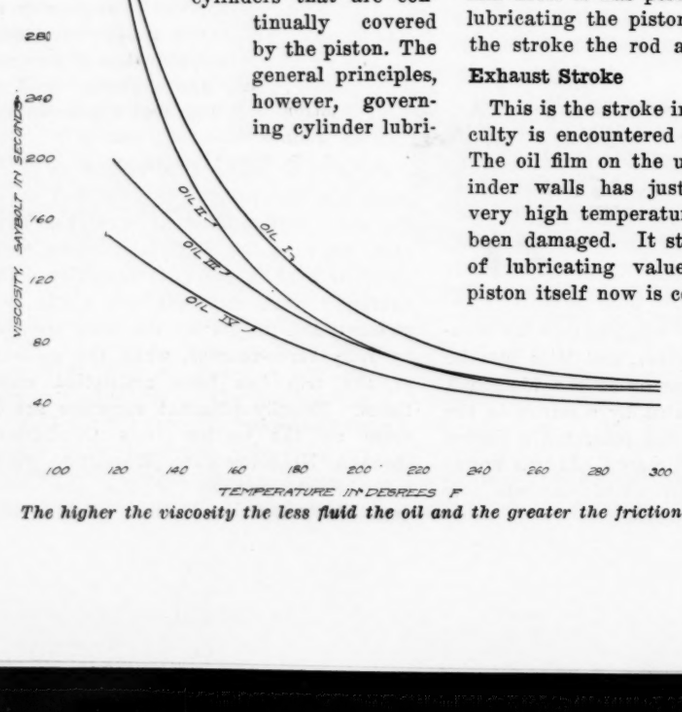
Third—The oil may not be supplied to the cylinders in the correct amount.

Fourth—The oil may be of good quality, but may not be suited to your particular engine.

Trouble due to the first case is in this day exceptional. That due to the second case is more frequent, but also is exceptional among well-known brands of oil. That under the third case depends sometimes on the design of the engine, but more often on the lack of care exercised in maintaining the proper oil level in the crank case. The remedy for both of these faults is obvious. Trouble encountered under this head may well depend, however, on the fourth case, in that it is necessary to use an oil that is suitable as well as of good quality, or the correct amount will not be supplied to the cylinders.

We can well assume that most of the engines now on the market are correctly designed. We can also safely assume that most of the different varieties of oils on the market are good oils when properly used in the right place.

Most motor car engines have their cylinders lubricated by the splash system, the bearings being lubricated by forced feed, splash, etc. In some cases the cylinders also are lubricated by forced feed, the oil being injected through small holes in the side of the cylinders that are continually covered by the piston. The general principles, however, governing cylinder lubrication, apply to both of these systems.



The higher the viscosity the less fluid the oil and the greater the friction

In the splash system on four-cycle motors the reserve oil is contained in the crankcase and each cylinder is lubricated by the splash of its own crank. A dipper on the end of the connecting rod dips into a trough of oil when the crank is at its lowest point, and with the upward stroke of the crank throws the adhering oil violently against the cylinder walls. The oil then is spread evenly on the cylinder walls by the piston as it slides up and down. The operation in a four-cylinder motor then is as follows:

Suction Stroke

On the previous up-stroke of the piston oil was spread on the cylinder walls, and this furnishes lubrication as the piston descends on the suction stroke. At the bottom of the stroke the connecting rod dips in the oil.

Compression Stroke

The film that has just lubricated the piston on the suction stroke will not be affected by the cool gases entering from the carbureter, and will be left intact to lubricate on the compression stroke. As the piston goes upward it smears a fresh film on the walls. A new supply of oil also is splashed on the lower part of the cylinder by the upward throw of the crank.

Explosion Strokes

The film smeared on the walls on the compression stroke also is sufficient to lubricate the piston on the down stroke. The combustion space on this stroke is exposed to a very high temperature, but the flame only comes in contact with the oil film after it has performed its purpose of lubricating the piston. At the bottom of the stroke the rod again dips in the oil.

Exhaust Stroke

This is the stroke in which the most difficulty is encountered with the lubrication. The oil film on the upper part of the cylinder walls has just been exposed to a very high temperature, and certainly has been damaged. It still possesses a degree of lubricating value, however, and the piston itself now is covered with a film of oil as it moves upward. The combination of these two should be sufficient for the lubrication of this stroke. If trouble is encountered due to faulty lubrication, however, it will show principally on this stroke.

Three essential requirements of a good motor-cylinder oil are:

First—It must lubricate at the temperatures encountered in the cylinder.

Second—It must give a good seal to the piston and rings, preventing leakage of gases and oil past them.

Third—It must burn without forming carbon deposits in the cylinder when oil gets into the combustion chamber.

The lubricating value of an oil is due to the fact that when the surfaces of the cylinder and piston are separated by a film of oil the friction of these two metal surfaces is eliminated, and the friction remaining is only that of the oil molecules sliding past each other.

The quality of an oil that gives the comparative measure of the friction generated is the viscosity, and this may be defined as its resistance to flow. Oil manufacturers generally express it numerically compared to that of water taken as unity. The consumer expresses it roughly as light, medium and heavy, terms that are generally understood. The higher the viscosity the less fluid the oil, and the greater the liquid friction. The viscosity of an oil decreases greatly with an increase of temperature.

The illustration will show this graphically. Oils I, II and III represent the heavy, medium and light grades of well-known brands of paraffine base oils. Oil IV is an oil of asphalt base, largely used. It will be noted that the falling off in viscosity with increased temperature is great in the case of heavy oils.

The deciding factor with regard to viscosity is the condition of the piston and rings. If these are tight, a light oil will be satisfactory. A heavy oil becomes necessary if they are worn and loose. If the oil is too light it will be drawn past the rings on the suction stroke, and on the compression stroke some of the gaseous mixture will leak past and tend to make the oil in the crankcase still lighter. Under the conditions of high rubbing speed and small piston-ring pressure that now are generally found light oils should give the most efficient results in the majority of cases.

Before discussing the effect of high temperatures, it will be well to determine just what they are. Recent experiments have determined that the maximum temperature attained in a gasoline engine is 2,700 degrees F., which is obtained only at the top of the explosion stroke. The temperature successfully is lowered as the gases expand on the explosion and exhaust strokes, and as the cool mixture enters the cylinder on the suction stroke. With the compression stroke the temperature begins to rise gradually until ignition takes place and causes it to jump to 2,700 degrees again at the top of the stroke.

Records in this experiment showed a maximum temperature of 2,700 degrees F., the maximum being 250 degrees F., the average during a complete cycle about 950 degrees F. These temperatures are those of the gases, and not those of the cylinder walls. There is considerable difference between the temperatures of these two.

Assume that the cooling water in the jacket is at a high temperature—say 200 degrees F., just below the boiling point. We can well assume from experiments on the transmission of heat in the steam boilers as the conditions are almost identical, that the temperature of the cylinder walls is about 60 degrees higher than the water. As long as the water is not boiling we know that the temperature of the walls is little, if any, higher than 260 degree F.

In air-cooled engines the temperature would be somewhat higher due to the different method of cooling the cylinders. This does not mean that it would become too high, however, as it has been often demonstrated that properly designed air-cooled motors do not heat excessively.

The action of heat on oils is indicated by two properties, the flash point and the fire point. The flash point is defined as being that temperature to which it must be heated in order that the vapors will give a slight explosion when exposed to an open flame. The fire point is about 50 degrees F. higher, and is that point where the oil will take fire when a flame is applied, and continue burning.

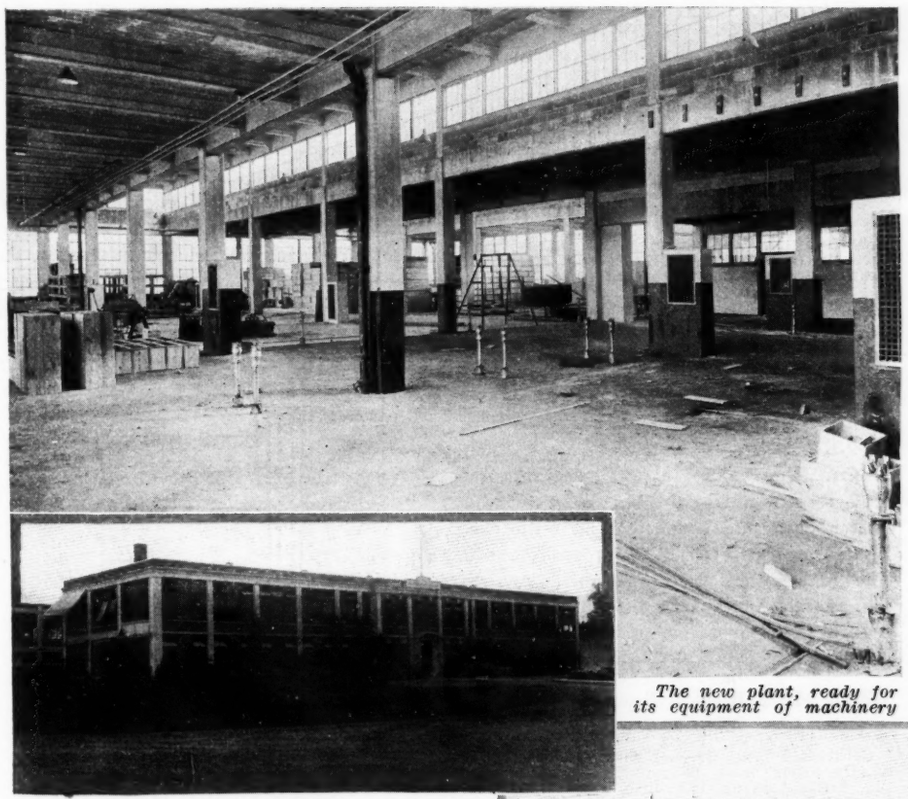
It is important that the flash point shall be higher than the temperature of the inner cylinder, otherwise the vapors given off by the oil will prevent its adhering to the walls. We have seen that water will boil when the temperature of the inner cylinder is 260 degrees F. The temperature of the film of oil cannot be much higher than this. I do not know of any oils having a flash point higher than 325 degrees F. Should the temperature of the cylinder walls get up to this temperature there is something radically wrong, and the remedy is not to get another oil of higher flash point, but to locate and remove the cause.

The question of carbon formations in the cylinder is a subject upon which much misinformation has been published. In the first place, what is ordinarily called carbon always contains something else in greater or less quantity. Rust, small particles of iron, and a large percentage of dust —silica—generally is present in motor car engine. The carbon may be blown out with the gases, or may remain in the cylinder. Whether or not it remained in the cylinder would depend largely on the condition of the oil film on the cylinder walls. Some oils form a thick viscous, gummy, asphalt-like deposit, which retains the carbon formed on its surface and prevents it from being removed with the exhaust. This gummy deposit gradually gets thicker and harder eventually forming the carbon deposit so well known.

In the absence of any gummy deposit of this kind to cement the free carbon together it generally is removed in exhaust.

The amount of oil necessary for the lubrication of motor cylinders depends on so many factors that no data can be given. It will be necessary to solve the problem for each type of motor. The heavier the oil the less the amount that will be used; also the tighter the piston and rings the less will be used. More than is necessary for lubrication simply adds to the formation of carbon.

New Prest-O-Lite Plant Like Model Factory



The new plant, ready for its equipment of machinery

One of the original factory group

INDIANAPOLIS, Ind., April 8—An addition to the main factory of the Prest-O-Lite Co., 100 by 400 feet, which is the second largest building of the present factory group, is practically complete and will permit a total production of 1,200 Prest-O-Lite storage batteries per day—three times the amount of the present output. The building in general is one story in height, with a monitor roof. It is of reinforced concrete construction. Floors in one-half of the structure are of brick, so as not to be affected by the action of the acids. The roof is of reinforced concrete, with a layer of cork under the roofing as an insulation against the sun's heat. Floor drains have been located at intervals of about 20 feet and those outlets provided at frequent intervals. It is the intention that the floors be washed down every day.

All of the plumbing appurtenances will be of the most modern type. Washing sinks will be placed at frequent intervals throughout the building and provided with mixing faucets, so arranged that employes will be obliged to wash in warm, running water. The construction of the building and installation of all electrical and mechanical equipment, also plumbing, is being handled by the construction and engineering department of the Prest-O-Lite Co., under the direction of C. B. Floyd, engineer.

The new Prest-O-Lite building, 100 feet wide by 400 feet long

The Readers' Clearing House

Do Manufacturers Overlook Construction Data?

CHICAGO—Editor Motor Age—Until a few days ago I was in the market for a new car and being exceptionally busy had no time to shop around and partake of demonstrations, so I sent for half a dozen catalogs of cars I was especially interested in, with the hope they would give full details regarding construction, etc. I have my own ideas as to what my new car should contain and through the above method thought I could eliminate those cars which did not conform to my ideas, thus saving my time and that of various salesmen.

Imagine my frame of mind when I perused one catalog after another and all utterly lacking in the essential information most valuable to the intending purchaser. They were filled with vague assertions which get nowhere. Why a concern will spend huge sums getting out a catalog which in a vague way only describes their product is a mystery to me.

The catalogs are about as full of information as the average automobile salesman. Sometime ago an automobile salesman was showing me his car. I inquired what a certain device at the bottom but not connected to the steering rod was for, and after a painful pause said, "Blessed if I know." Shortly after in looking over another one and pointing to an arrangement on the transmission case I inquired of the salesman as to the duty of the part and received a reply similar to the above.

From my experience as per the foregoing I am quite convinced it is usually the color of the paint that sells most cars, or else the buyer must sell himself, as information is a rare commodity in the motor car industry.—C. E. Platte.

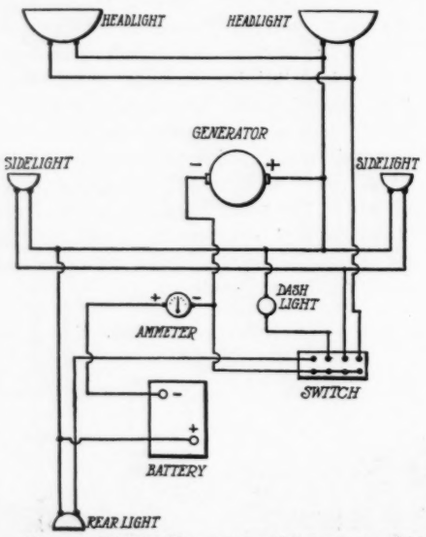


Fig. 1—Illustrating connections on car having a generator charging a battery through an ammeter, and a push-button switch controlling head, tail and side lights, all connected in parallel.

Reader Raises Point That Catalogs Leave Much to Be Desired

WIRING CAR FOR REMY GENERATOR

This Unit Is Designed for Control of Current Through Relay

Niagara Falls, N. Y.—Editor Motor Age—I have a car with gas lights and am putting on electric lights, also a Remy generator. Am driving the generator by fan belt. Kindly send me a wiring diagram showing how I should wire lights and generator. The generator is like that used on the 1914 Mitchell fours and sixes.

2—Is the cutout or relay on the generator sufficient to keep from overcharging the battery, or will I have to install another cutout?

3—What is the voltage of generator?—G. A. Hulett.

1—This is shown in Fig. 3.

2—The generator with the relay is designed to charge a six volt battery so the installation of another cutout will not be necessary.

3—This is a six-volt generator.

CAN'T GET GENERATOR TO CHARGE

Switchboard Necessary to Get Good Results—Proper Connections

Madrid, N. Y.—Editor Motor Age—I have recently installed a 9-KW. 32-volt direct current Fairbanks-Morse generator to light my garage and expected to charge my motor or batteries from it, but have had poor results. I have no switchboard, ammeter or voltmeter and run my light wires direct from the generator through a rheostat and then through a switch and fuses. How can I get good results charging batteries using lamps for resistance?—A. W. Sheets.

Fig. 6 shows proper method of wiring a 9-KW, 32-volt Fairbanks-Morse generator. You cannot expect very satisfactory results until you put in a suitable switchboard and connect it up with your lights and batteries in a proper manner. The maker can furnish such equipment and install it properly, or advise you in regard to its installation.

WANTS TO CONVERT REO THE FIFTH

Would Make It Into Tractor to Replace Five Horses

Central Point, Ore.—Editor Motor Age—Kindly advise how to convert my 1912 Reo the Fifth touring car into a plowing and general small farm tractor. I want a light tractor, one not clumsy to operate, and fitted with four cylinders.

1—Would it be possible to use the regular Reo transmission and differential, and would I have to gear the differential down. I do not wish to race the motor more than necessary.

2—Could this motor be made to do the work of five ordinary 1,300-pound work horses, such as operating a 14-inch gang plow, plowing to a depth of 5 and 6 inches?

3—Publish a diagram of the 1910 Reo "Used as a Tractor" that was on exhibition at the state fairs. The tonneau and the rear wheels had large steel wheels clamped into the regular wheels. These large wheels would be quickly taken off, leaving the car for touring, etc.

4—About what per cent do aluminum alloy pistons decrease vibration?

5—About what per cent decrease in gas consumption do they show for the average car, such as the Reo?

6—Have aluminum pistons been thoroughly tried out on the Ford car, and if so, what were the results?—R. J. Arnold.

1—You would probably have to gear it down somewhat.

2—That is asking a great deal of it, but it might do it.

3—We regret that we have no such illustration.

4—That would be difficult to say. Because they are lighter they should reduce it some, since vibration is cut down by lessening the weight of the reciprocating parts.

5—We have no data on this.

6—The results have been highly satisfactory.

Ford Valve Timing

Oak Park, Ill.—Editor Motor Age—I notice in the March 2 issue of Motor Age the valve timing given C. A. Lanon for high speed motors. You do not state whether the valves are fully open or just beginning to open at the given degrees.

2—Please give me the stock Ford valve timing.—Paul D. Harvey.

1—They are just starting to open at the points mentioned.

2—The Ford company gives the valve timing of the Model T engine as follows: The exhaust valve opens when the piston reaches $\frac{5}{16}$ inch of the bottom center, the

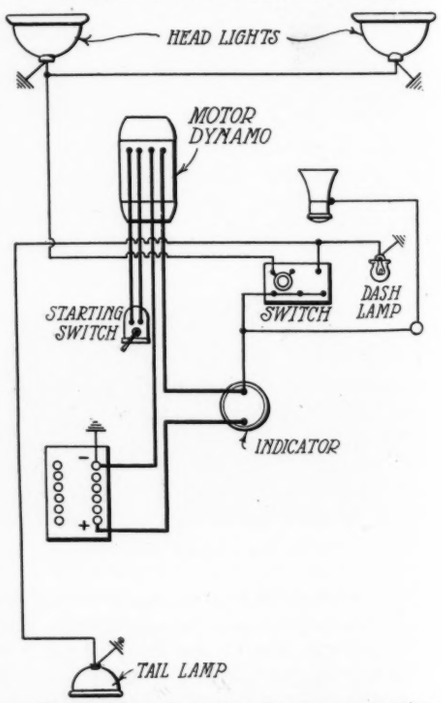


Fig. 2—Showing wiring diagram connections for a North-East starting and lighting system on the Dodge car

distance from the top of the piston head to the top of the cylinder casting measuring 3⅜ inches. The exhaust closes on top center, the piston being $\frac{1}{16}$ inch above the cylinder casting. The intake valve opens $\frac{1}{16}$ inch after top center and closes $\frac{9}{16}$ inch after bottom center, the distance from the top of the piston to the top of the cylinder casting measuring 3⅛ inches.

MAKING A MAGNETO CHARGER

Reader Desires Data on Size of Wire to Use for Best Results

Bayard, Ia.—Editor Motor Age—In the February 10 issue was an article in regard to magnet charging. I desire to make one and wish to know how much and what size magnet wire to use, to secure the best results, on a 110-volt direct current.

2—How many lamps will have to be used in series?—C. W. Ballard.

1—There are a number of sizes and shapes of electro-magnets that would do the work, but perhaps the most practical and easiest to make is one that has a diameter of about 4 inches and a height of about 7½ inches. The core should be made of a cylindrical piece of soft iron about 1 inch in diameter and you can use a disk of fibre material at either end to hold the wire on. Carefully wrap the iron core with a piece of heavy oiled paper and then shellac it. Leaving about 12 inches of length free, wind about 10 pounds of No. 22, B & S-gauge, insulated copper wire around the core carefully and evenly throughout its length. Wind the two spools in opposite directions so that a north pole of one will be opposite a south pole of the other when you assemble the two wound spools side by side on a wooden base so that they are about ½ inch apart. Connect them in series and then run the end wire from each to the current source through a switch.

2—You would not have to use any.

Wiring of a Dodge

Kewanee, Ill.—Editor Motor Age—Kindly publish wiring diagram of a 1915 Dodge car for both starting and lighting.—Charles C. Motley.

This is shown in Fig. 2.

Making Electro-Magnet Charger

Portland, Ark.—Editor Motor Age—In a recent issue of Motor Age I noticed an article on magnet recharging. How many turns of wire would one use if going to wind an electro-magnet for charging magnets? What size wire is best to use if one used 110 volts, 5 amperes and what size wire would be best if this current was not available? What battery current would be needed?

2—Would one use a soft core or a hard core and what size core?—B. B. Corson.

1—Directions for making such a magnet are found on page 35, of the March 30 issue of Motor Age. Use the regular 110-volt D. C. lighting circuit.

2—Soft iron core, size given in article above referred to.

Probably a Timing Error

Parsons, Kan.—Editor Motor Age—I have a 1915 Briscoe in which the engine runs very unevenly. The engine cannot be throttled down to run slowly. The valves have been dressed down and ground twice in the last 2 months. The carbureter has been adjusted several times. Could Motor Age advise a remedy?

2—When the engine is put through a hard pull it fires back through the carbureter. The garage mechanic has not been able to adjust the carbureter so as to prevent this. Kindly suggest a remedy.—C. L. Shrewsbury.

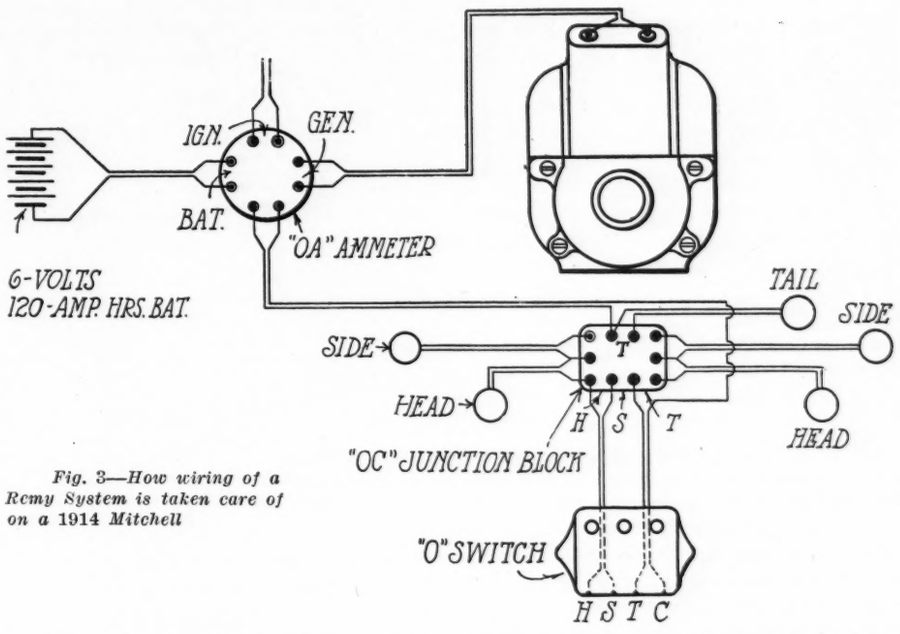


Fig. 3—How wiring of a Remy System is taken care of on a 1914 Mitchell

1—Possibly the ignition is not timed correctly, but the main trouble is undoubtedly with the carbureter adjustment, providing you have good compression in all the cylinders. If the compression is poor that would be a reason.

2—The mixture is too lean. Adjust the carbureter for a slightly richer mixture.

BATTERY VS. MAGNETO IGNITION

Chicago—Editor Motor Age—Is the battery ignition better than the magneto? If so, why?

2—Is it possible to connect a magneto and switch it on in case the battery should give out.

3—Will half gasoline and half kerosene work in a gas motor? What are the disadvantages?

4—What advantages have a six-cylinder or more over a four-cylinder?—Howard Luce.

1—Battery ignition is not better than magneto, but it generally is considered to give a hotter spark at low engine speeds, which is an advantage at starting. Battery ignition lends itself well to the present-day electrified car, for since the storage battery is necessary for the lighting and starting apparatus, it can just as well take care of the ignition. However, there is this objection to battery ignition—if the battery fails your car is dead, whereas, with a magneto you have ignition current as long as the engine operates.

2—Dual systems are very common, whereby either magneto or battery can be used, but you could not connect a magneto ignition system to your lighting and starting battery.

3—Not very well, although it will sometimes. Kerosene is a heavier fuel than gasoline and does not vaporize as readily. For that reason, a gasoline carbureter will not do for kerosene. The nearer your fuel comes to being kerosene, the harder it is for the gasoline carbureter to handle it, therefore.

4—Chiefly the greater continuity of torque due to a greater number of power impulses which overlap. A six is in theoretical balance, whereas a four is not.

Lowering Center of Gravity on Ford

Caney, Kan.—Editor Motor Age—I would like to have some information or suggestions how to lower the center of gravity on a Ford. A Ford body for track work stands too high, and any help you can give me will be greatly appreciated. Also will wire wheels help any to make the car better for racing, stronger or faster?—O. Antoine.

1—Fig. 4 shows how one reader of Motor Age lowered the frame of a Ford. This seems to be a very simple procedure, and doubtless will meet with your approval. The diagram shows how the frame supports are attached to the springs and the frame.

2—A great many race drivers prefer wire wheels, which is a pretty good recommendation for them for speed work.

Testing Storage and Dry Batteries

Chicago—Editor Motor Age—Kindly advise me on the following:

1—Why is a storage battery tested with a voltmeter while a dry cell is tested with an ammeter?

2—In charging a storage battery how is it possible to tell when fully charged. If using a hydrometer what should the reading be? If a voltmeter is used should the reading be taken while battery is idle or under load?

3—What are the symptoms of an overcharged battery?—J. M. Stihman.

1—An ammeter indicates the current being drawn at any time, while a voltmeter indicates the voltage. A dry cell also should be tested with a voltmeter.

2—A fully charged storage battery has a hydrometer reading between 1.280 and 1.300. Best to take it when idle.

3—The plates usually buckled.

PUTTING LIGHTS ON A BUICK 28

Diagram Given to Show the Wiring Plans —Ammeter Would Help

Chippewa Falls, Wis.—Editor Motor Age—I wish to install an electric lighting system on a model 28 Buick. Will Motor Age kindly advise me what is necessary for a lighting system?

2—Will Motor Age kindly give a diagram showing the wiring of such a system?

3—Kindly advise me as to where I can secure a system which Motor Age thinks satisfactory. —Robert C. Morgan.

1—For a lighting system that will charge itself you must have a generator driven from the engine in some way, a storage battery, switch, and lights as desired. An ammeter is also a good thing to have.

2—A diagram of a simple wiring system using a generator is shown in Fig. 1.

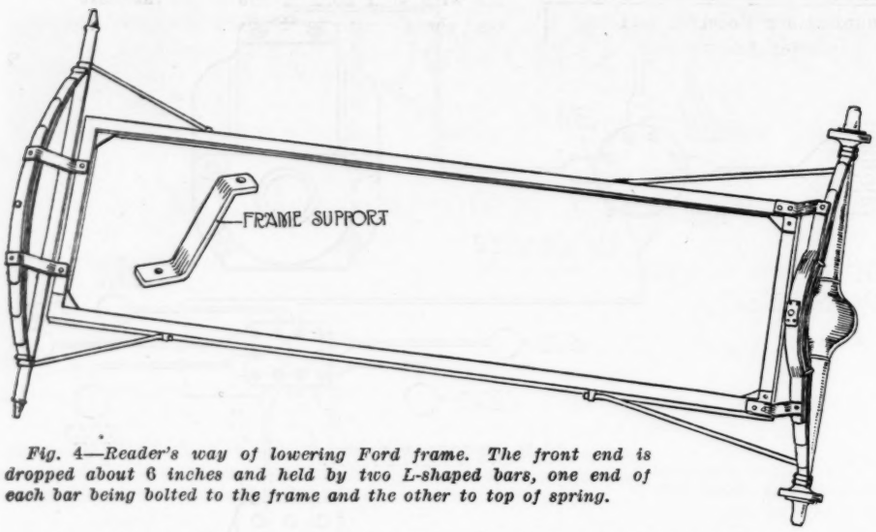


Fig. 4—Reader's way of lowering Ford frame. The front end is dropped about 6 inches and held by two L-shaped bars, one end of each bar being bolted to the frame and the other to top of spring.

3—Any of the lighting systems advertised are excellent, and should give you good results. Among the makers of this kind of equipment are Gray & Davis, Boston, Mass.; Hartford Suspension Co., Jersey City, N. J.; Dyneto Electric Co., Syracuse, N. Y.; Apple Electric Co., Newark, N. J.; Fisher Electrical Works, Detroit; Simms Magneto Co., East Orange, N. J.; Vesta Accumulator Co., Chicago; Picard & Co., New York.

DATA ON THE STUDEBAKER GEARSET

Being in a Unit with Rear Axle Offers No Unusual Difficulties

Albany, Tex.—Editor Motor Age—Is there any good reason why the transmission on the new 17 series Studebaker cars should give the owner any more trouble on account of being built in unit with the rear axle than if it were just back of the clutch as most other car manufacturers place it?

2—Is it not a fact that by having the transmission built in unit with the rear axle as on the Studebaker car that it will cause much less strain and stress on the universal when pulling in low gear?

3—Does it not give the spring action more freedom?

4—Please name all the American built cars that build the transmission in unit with the rear axle.—A Subscriber.

1—No.

2—With the gearset in unit with the rear axle, the universals operate at the same speed as the engine, but there would probably not be any appreciable difference between having the universals ahead or back of the gearset.

3—No.

4—Briscoe 4-38, Cameron, Chalmers models 40 and 48, Crow-Elkhart, Inter-State, Lenox, Overland, Paige 6-36, Partin-Palmer, Regal, Saxon, Studebaker, Stutz, Trumbull.

Life of a Storage Battery

Chicago—Editor Motor Age—How long should the storage battery, 6-volt, in the modern cars of today last if they are kept properly filled with distilled water and never allowed to become discharged?

2—If one cell goes dead is the purchase of an entire new battery necessary, or can the dead cell be repaired, and if so, at about what expense and how long will the battery be good for?—Subscriber.

1—That would be almost impossible to state, although 2 or 3 years is not too long a time if taken care of. Sometimes careless motorists can ruin a battery in 6 months.

2—Simply repair the bad cell, when the battery should be as good as ever. We cannot tell you the cost, but any battery service station can.

Impractical to Fit Elliptics

Sunnyside, Nev.—Editor Motor Age—Can full elliptic springs be attached on the rear axle of a 32 model Hupmobile? If so, what size would I use and how would they be attached?—A Reader.

1—It would not be practical to do this, to say nothing of the trouble and expense without any advantage after it was done.

PERSISTENT KNOCK IN A BUICK 45

May Be Caused by a Broken Piston Ring or in Valve Stem Clearance

Clovis, N. M.—Editor Motor Age—I have driven a 1916 Buick D-45 3,000 miles and it has developed a knock. Most of the time it seems to be in the front end and then again it seems all over. Have removed the carbon from the cylinders and ground the valves, cleaned spark plugs, looked at the connecting rod bearing and camshaft and cannot locate it. There are other cars here of the same model and they also have the same knock and none of the mechanics have been able to locate it.—A. V. Kauble.

MOTOR AGE erroneously stated in a previous issue that in remagnetizing it was very dangerous to oversaturate the magnets, because such procedure would render them useless. This has been called to our attention and on thorough investigation we find that the results of over-saturation are not so serious as pointed out. While oversaturation might result in a slight overheating and waste of current, at the same time this is not serious and will not materially harm the magnetic properties of the magnet.

Possibly you have a broken piston ring in one of the front cylinders, or the valves are not set up so that there is the right clearance between the ends of the rockers and the valve stems. It might be that one of the main bearings needs adjustment. It is exceedingly difficult to diagnose a case of this kind without more specific details as to just what symptoms the engine has. Surely a good mechanic could determine the trouble, which could be eliminated by properly overhauling the engine.

Building a Farm Tractor

Monticello, Wis.—Editor Motor Age—I have an old 40-horsepower motor in good shape and would like to mount it on a truck to do farm work. Please advise how much a motor like that would pull according to gasoline engine and where can I get a control governor for it that would work good?—Edward H. Theiler.

1—Your question is not clear, but the engine should be powerful enough for such service.

2—Makers of governors are: Duplex Engine Governor Co., New York; Hoffecker Co., Boston, Mass.; Kramer Governor Co., Detroit; Pierce Speed Controller Co., Anderson, Ind.; W. M. Steele, Worcester, Mass.

SOME DATA ON HUDSON SUPER-SIX

Reader Wants to Know Gear Ratio Used at Sheepshead Test

Lincoln, Ill.—Editor Motor Age—What were the gear ratios used in the Hudson at Sheepshead Bay?

2—What would be the speed of this car with the lowest ratio on 35 by 4½-inch tires?

3—Did Packard and Cadillac use stock gear ratios in these tests, and what were they?

4—Where did Packard make its test, and at what speed?

5—What would be the speed of a car geared 4 to 1 on 36 by 4½-inch tires, and a motor speed of 3,000 r. p. m.?

6—Is the Sheepshead Bay track considered faster than the Chicago speedway?

7—Have not the principles used in the Hudson motor been used to some extent in racing motors?

8—Has there ever been a racing car equipped with battery ignition?

9—What would be the difference in cost of a battery system and a high-tension magneto?

10—Who originated the idea used in the Hudson motor?

11—Who holds the world's stock car record for 500 miles, and what is it?—A Reader.

1—For the acceleration tests, 4 5/11 to 1; for the speed tests, 3½ to 1.

2—Tuned up, the stock car would perform similarly to the way it acted at Sheepshead Bay, with the 3½ to 1 ratio. With the lower ratio, it would deliver about 65 miles an hour.

3—Yes, but we have no record of what they were.

4—On the Chicago speedway, the speed attained was 72.7 miles an hour for 10 miles with windshield up and top down.

5—80.28 miles per hour.

6—It proved to be last year.

7—The Hudson company claims an entirely new principle of balancing.

8—Not to our knowledge.

9—Battery system would be cheaper if the storage battery were already on the car.

10—The Hudson engineers.

11—We have no record of any such test as you mention.

GENERATORS ON OPEN CIRCUIT

Winding Will Burn Out if Battery Connection Is Severed

Towanda, Kan.—Editor Motor Age—Why is it not good to run a generator when it is not connected with the battery.—W. C. Robison.

Because you run the generator on open circuit, which builds up a high voltage that will burn out the windings. This renders the generator useless.

Increasing Power and Speed

LeMars, Ia.—Editor Motor Age—If I increase the compression by putting on new alloy pistons and increasing length of piston from wristpin to top of piston ⅛ inch, then increase size of intake manifold so as to use a carbureter 1½ to 1¾ inches in place of 1¼, will I increase power and speed of car on say a four-cylinder motor 4 by 6?

2—Would raising the compression make car pound or hard to throttle down?—W. L. Button.

1—Yes, it ought to.

2—Not unless you raised it too much. Remember that there are limitations to the pressure which the engine will withstand, and that too high a pressure will cause pre-ignition.

WANTS TO SPEED UP MAXWELL 25

Installing Double Port Exhaust Would Not Pay for Trouble and Expense

Ft. Collins, Colo.—Editor Motor Age—I have a 1915 Maxwell 25 in which I wish to develop a little more speed. Would it be of any advantage to double port the exhaust. If so please show the method by diagram.

2—Does Motor Age know of any concern making a manifold for the second port of this make?

3—Would Motor Age advise changing carbureters?

4—Can Motor Age give me the address of the firm that makes the carbureters for the 1915 Maxwell 25? I think it is called the K-D carbureter?—Donald Boston.

1—Not enough to make up for the trouble and expense.

2—No, unless you can find one in the Clearing House Section of the advertising pages.

3—Not necessarily, providing you can get the adjustment you want on the one you have.

4—K. D. Carbureter Co., 5915 Bonna avenue, Cleveland, O.

FIT ALUMINUM PISTONS IN HUDSON

This Would Not Affect the Balance of the Crankshaft

Brooklyn, N. Y.—Editor Motor Age—Would fitting aluminum alloy pistons destroy the effect of the balance of crankshaft in the Hudson super six?

2—Could tungsten valves be obtained for a Saxon four 1916 model? Is there any object to substituting them? The present valves require frequent grinding.

3—What are the arguments for and against aluminum pistons other than the light weight and increase heat conductivity. Are they liable to wear extremely rapidly? What is the largest bore in which they are suitable?—Subscriber.

1—No.

2—They probably could, and have the special advantage that they resist pitting and should prove very satisfactory.

3—They reduce the reciprocating parts weight which tends to reduce vibration. They have to have practically twice the clearance of cast iron pistons to allow for difference in expansion, and this sometimes is made an objection due to slight slapping at starting and until the engine gets heated. This slap does not last but a few minutes at most. Their wearing qualities are said to be equal to any other piston. They are suitable for any size of motor car engine as has been proven conclusively.

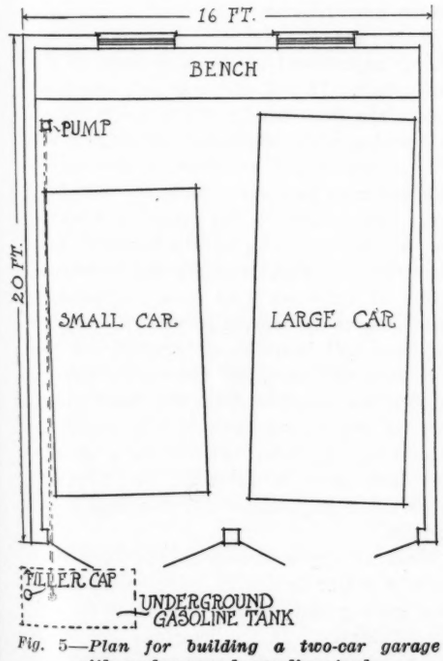


Fig. 5—Plan for building a two-car garage with underground gasoline tank

Communications Received and Inquiries Answered

C. E. Platte.....Chicago
G. A. Hulett.....Niagara Falls, N. Y.
A. W. Sheets.....Madrid, N. Y.
Paul D. Harvey.....Oak Park, Ill.
R. J. Arnold.....Central Point, Ore.
C. W. Ballard.....Ballard, Ia.
O. C. Motley.....Kewanee, Ill.
B. B. Corson.....Portland, Ark.
C. L. Shrewsbury.....Parsons, Kan.
Howard Luce.....Chicago
O. Antoine.....Caney, Kan.
R. C. Morgan.....Chippewa Falls, Wis.
J. M. Stihman.....Chicago
A Subscriber.....Albany, Tex.
A Reader.....Sunnyside, Nev.
Subscriber.....Chicago
A. V. Kauble.....Clovis, N. M.
E. H. Theiler.....Monticello, Wis.
A Reader.....Lincoln, Ill.
W. C. Robison.....Towanda, Kan.
W. L. Button.....LeMars, Ia.
Donald Boston.....Ft. Collins, Colo.
Subscriber.....Brooklyn, N. Y.
Ellis Gotcher.....Brownwood, Tex.
Earle L. Buckey.....Union Bridge, Md.
Herbert Lagasse.....Rice, Kan.

No communications not signed with the inquirer's full name and address will be answered in this department.

TROUBLE WITH ELECTRIC SYSTEM

Horn Operates at Times and at Other Times Does Not

Union Bridge, Md.—Editor Motor Age—I had considerable trouble last fall with my electric generator on a 1915 Weidley model Premier, and would like to have some advice from Motor Age.

The generator is a Remy 6-volt, model 12. The first noticeable trouble was with the electric horn, very often it would not blow at all. At times, when it would, the lights would be made dim; sometimes when the lights would be turned on the horn would blow. Then later as the output of the generator decreased at low speed of engine, if car was kept going above 30 miles per hour the ammeter would then go back to 14 or 15 amperes. Finally the generator stopped charging entirely. I cleaned the commutator with gasoline and took out one of the brushes and cleaned it. The one on the outside with the third brush was so close to the engine base that it could not be gotten out, so I could not clean it, or the third brush, either.

When I put the car away for the winter, I took off the generator and bolted it to a one-horsepower gasoline engine, that ran it about 700 r.p.m. Was that too slow? After I had given it a thorough cleaning I attached a volt and ammeter to it, having the generator connected to a battery, of course, and found it to develop 12 and 13 amperes and 8 to 9 volts. The old brushes were not so worn out. I put in new ones. The commutator was worn down to the center in the path of the third brush, so I took a very fine glue and while the generator was running cut the two sides down level with the center and then smoothed it up with No. O sandpaper. Then tried it out, but it did not seem to better it any. There was something else I forgot to mention above, and that was that sparks would fly from both main brushes, with both old and new ones. Would also get very hot. If I would disconnect brushes and run generator light it would not heat or spark either. If I would speed the engine up the generator seemed to develop 14 to 15 amperes, so I thought it was not running fast enough, so put on larger pulley and ran it about 1,100, but it still sparked at brushes and got very hot. I only ran it about 5 minutes and had to stop for it to cool, and the next time I ran it it refused to generate any current at all. Kindly tell me what to do.

Is the cylinder nearest the radiator called the first cylinder in firing order?—Earle L. Buckey.

1—It seems most probable that the trouble with your horn is due to an intermittent short circuit in the horn wiring which is closed when the horn button is depressed. This would, of course, reduce the voltage, thereby dimming the lights and would at times prevent the operation of the horn. A ground in one of the lighting circuits would complete the horn circuit—through the ground in it—and cause the horn to blow when the lights were turned on. We would advise investigation at this point first.

From the last paragraph of your inquiry we are reasonably certain that you have spoiled your generator commutator. It is probable that you have cut it down to the mica, that is until it is smooth, which, of course, would cause sparking at the brushes and consequent heating of the machine. At any rate, we beg to call your attention to the fact that it would be almost impossible to cut the commutator down with a file, and while it was still in the generator, with any degree of truth. At the factory, machines of great accuracy are employed for turning and testing these commutators as a rough or out-of-round commutator will cause sparking at the brushes. We would suggest that you take your machine to a Remy service station or branch or return it to the factory to be overhauled and that you go over the wiring of your car carefully, insulating all ground and short circuits.

2—Yes.

Garage Plan for Two Cars

Rice, Kan.—Editor Motor Age—Would like the plan for a home garage, size 16 feet by 20 feet, arranged so if necessary it will accommodate two cars with a gasoline pump from underground tank.—Herbert Lagasse.

1—A suggested plan is shown in Fig. 5. This is for a garage 16 by 20 feet, made to accommodate one large and one small car. A bench is provided in the rear and place is indicated for an underground tank and filler cap. Two doors are provided, for easy ingress and egress. This size garage should conveniently handle any two cars you might wish to use it for.

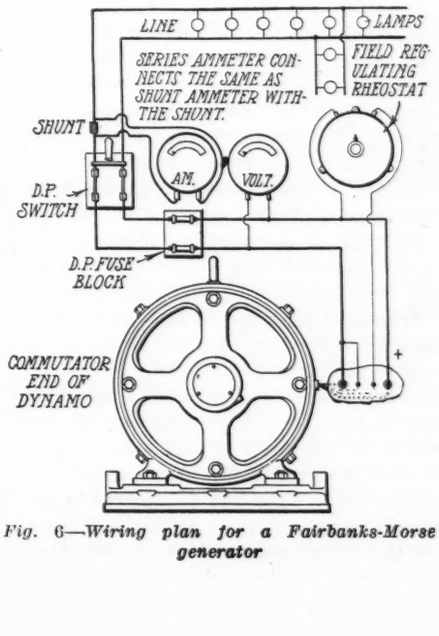


Fig. 6—Wiring plan for a Fairbanks-Morse generator

The Motor Car Repair Shop

Angle Between Cylinders in V-Motors

This Is a Point That Cannot Be Arbitrarily Fixed by Engineers

A GREAT many persons have the impression that engineers can arbitrarily fix the angle between the blocks of cylinders in eight- and twelve-cylinder engines. They believe that this angle is chosen in accordance with the ideas of the engineer who designs the motor, and that space width under the hood is a governing factor in the determination of it.

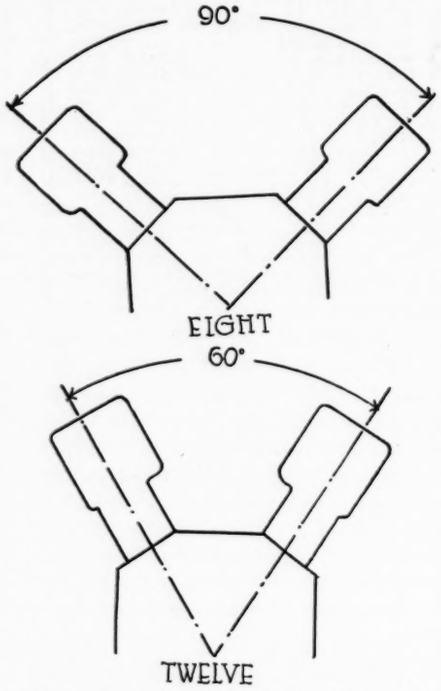
Nothing could be further from the truth, and with the great number of multi-cylinder V engines now in use, it seems advisable to correct this misconception. In fact, the engineers have no control over the angle, for the number of cylinders immediately settles that point for them, and there is no chance for deviation. If there are eight cylinders the angle must be 90 degrees; if twelve cylinders it has to be 60 degrees.

Reason for V Width

To get the reasons for this clearly in mind it is necessary to remember that in the four-cycle engine, which type is in universal use today, there are four events that have to be completed for every power impulse per cylinder that is given to the crankshaft. That is, the piston has to move downward twice and upward twice to complete the cycle. That means that the crankshaft revolves twice to receive one impulse from a given cylinder. With four cylinders there is a power impulse every half revolution or two per complete revolution. If the motor is a six, there are three impulses for one crankshaft revolution. In an eight, you have four per revolution, and six per revolution in a twelve. From this it will be seen that there are half as many power impulses per revolution of the crankshaft as there are cylinders.

Inasmuch as a revolution means covering 360 degrees, it is evident that in an eight there must be a power impulse every 90 degrees if four are to be covered in a complete revolution, and one every 60 degrees if six must be included per revolution as in a twelve-cylinder motor. In other words, from the beginning of one impulse in the eight to the beginning of the next the crankshaft has to revolve 90 degrees in the eight and 60 degrees in the twelve.

In the V-type engine the impulses alternate from one side to the other. That is, an impulse in a cylinder in the block on one side is followed by an impulse in the opposite block. From the above we have noted that in an eight the crankshaft cannot travel any greater nor any less angle between impulses than 90 degrees, so that, in order for a piston to be in proper position to fire after a previous firing in a cylinder across the V, the angle between the cylinders has to be 90 degrees. By a similar reasoning the twelve must have 60 degrees between cylinders.



The angle between the cylinder blocks in an eight-cylinder engine has to be 90 degrees; in a twelve-cylinder it must be 60 degrees

The rule that has to be followed, therefore, is to divide 360 degrees by half the number of cylinders, thus determining the necessary angle between the cylinder blocks.

Hints on Saving Gasoline

Gasoline is one of the uppermost considerations of the motorist now, and it behooves all to think of all ways and means of saving the fluid as much as possible. Many a gallon is spent to no good purpose, but as the price advances it seems likely that car owners will be more careful to make it go as far as possible.

There are many little things the careful driver can do to keep from wasting fuel. Each may be thought small and even insignificant in itself, yet they have a cumulative effect upon the amount used, and perhaps the total wasted by careless

Number of Cylinders Determines Definitely What Space Shall Be

practices would be surprising if it were figured out.

Many a time you will see an engine running for a long period while standing at the curb, through nothing more than thoughtlessness of the driver in not shutting it off when leaving the car. This counts up in time and is a dead waste. It is just as easy to switch off the ignition when intending to leave the car even for a few moments, and even if the car has to be cranked again by hand it is worth the effort.

Improper Carbureter Adjustment

Another source of fuel waste is improper carbureter adjustment. You cannot always blame that very important accessory when you do not get proper economy from the engine. Too rich a mixture will oftentimes not materially affect the running but it is wasteful. It is no great trick to adjust the carbureter for just the right mixture, and this not only effects a fuel saving from the standpoint of less raw fuel in the charge but also from the fact that a correct mixture is more powerful and hence serves to drive the car at the desired speed with less throttle opening, diminishing the fuel demand with even better performance.

Much gasoline is also wasted by improper adjustment of the float level in the carbureter. If not properly set, the float allows the float needle valve too much of an opening with consequent flooding of the float chamber and overflow of fuel down into the mud pan and eventually onto the road. There are all too many cars which you will see standing with a constant drip from the mud pan, denoting this very condition of improper float level adjustment, which shows up especially when the car is standing and there is no drawing of the fuel into the body of the carbureter to relieve the overflow from the float chamber. If you do not know how to overcome this condition, take the car to a garage man and have it attended to. Usually there is an adjustment for the float level position.

Most everyone overlooks the fact that when a motor is not in good condition it uses more gasoline than if it were operating efficiently. If the bearings are worn and there is lack of proper lubrication the

motor has greater internal friction. This has to be overcome, and consequently more power has to be expended in useless work than would be required were the engine operating with the minimum amount of power waste due to internal conditions. This excess power is not productive of useful work in propelling the car, hence it takes more gasoline—a wider throttle opening—to get a given speed than if less power were expended non-productively.

Part of the overhead is also chargeable to the chassis. If the wheel bearings are not cared for they add to the friction; improper lubrication of the other bearing surfaces in the transmission system increases the friction, and this has to be overcome by a greater expenditure of power. Thus we get back to the gasoline, for that is the power source. The more efficiently the whole car runs the more economical will be the fuel consumption.

Another source of gasoline waste is needless speeding or racing of the engine by suddenly stepping on the throttle when the car is standing. This causes wasteful charges of fuel to be sent to the motor, for such sudden rushes have the effect of shooting considerable quantities of raw fuel into the manifold and even the combustion chambers. This excess either condenses on the cylinder walls to eventually find its way into the crankcase and lubricating oil, or it forms carbon.

ROADS PHOTOGRAPHIC CONTEST

Washington, D. C., April 10—A photographic contest to aid the good-roads-everywhere movement, for which cash prizes amounting to $2,600 have been provided, was announced here today by the National Highways Association. The competition is open to everybody. The photographs will be made a part of an exhibit at Washington to portray a national scheme of improved highways and will include illustrations of bad roads as well, so that comparative exhibits may be devised. The first prize will be a cash award of $500. This may be won by a photograph of either good roads or poor roads. In all there will be 166 cash prizes, including five second prizes of $100 each and other prizes of $25, $15, $5 or less. The judges of the contest will be Theodore Roosevelt, Ida Tarbell and Mark Sullivan.

SIGNAL LAMP VISIBLE 100 MILES

Washington, D. C., April 8—E. G. Fischer, chief of the instrument section of the coast and geodetic survey, department of commerce, has just completed the design and construction of a signal lamp which will be used during the coming summer in the mountainous regions of Idaho and Oregon on primary triangulation, where the distance between stations is frequently as much as 100 miles. This lamp has been tested and shown to be more than 150 times as powerful as the acetylene signal lamps which have been used for a number of years by the survey.

Tires, Their Care and Repair

(Concluded from page 31)

After the cut is properly filled, place a piece of waxed paper as large as the face of the vulcanizer on top of the repair. This is to prevent the vulcanizer from sticking to the rubber. From this point forward the operation consists in simply clamping on the vulcanizer and starting the heat according to the manufacturer's directions. The exact method depends upon the type and shape of the vulcanizer, but there is nothing at all intricate about it.

The chief point to watch is that the proper heat is maintained for the proper length of time and not too long. The manufacturer's instructions indicate this and they should be followed to the letter, because the raw rubber is very much like bread dough and too little heat will undercook it, and give trouble later, just as will too great a heat overcure it and perhaps even damage the casing rubber. In case the shape of the tire does not exactly fit the concave portion of the vulcanizer it can be made to do so by letting air out of the tire.

If a casing has been run for some time with a cut in the tread, a quantity of sand and dirt is almost sure to work in and has begun to form a sand blister. In this case, investigate the inside of the tread thoroughly with a stick or knife to make sure that all the sand is cleaned out. Cut away all the torn rubber and wash thoroughly with gasoline.

If not more than 1 inch of the rubber is cut away it can be filled, as described above, but if there is a very much larger hole, it will need to be built up and is a job for the tire repair man. What he does is to apply several coats of vulcanizing cement, allowing each to dry thoroughly and fills it with raw rubber to a point almost flush with the tread. Then he wraps the casing tightly with strong tape that has been soaked in water and the vulcanizer is applied.

Many of the vulcanizer makers provide complete outfits with their instrument, with which the proper cement and raw rubber or gum is incorporated. Some of them even supply all the tools necessary, in special outfits.

Vulcanizing Tubes

Before commencing the actual preparation of the repair of the tube, be sure to sprinkle a liberal but even coating of tire talc or soapstone inside the tube at the point of repair to prevent the two sides sticking together. Some motorists insert a small piece of waxed paper before commencing the work, but it may be imagined that the possibility of the wax paper becoming loose and floating around the tube and it is open to objection.

In mending tubes, the process is equally simple. The hole in the tube is cleaned with gasoline and also a space perhaps 2 inches in diameter around the hole. It is well to rough up the surface of the rubber around the hole with coarse sandpaper or scrape it with a knife. The reason for this is to remove the oxide which forms when rubber is exposed to air.

With a brush, a clean stick, or a clean finger, rub on a thin coat of vulcanizing cement, covering the space, and allowing the cement to dry from 3 to 5 minutes or longer, until it becomes "tacky." Then, with a match or a nail or screwdriver, poke a small piece of the raw rum or vulcanizing rubber into the hole and then apply over it a patch of raw gum about the size of a half dollar and press it down thoroughly with the thumb to insure perfect adhesion.

Then put a piece of wax paper on the side of the vulcanizer plate over the patch, having first laid the tube with the patch up on a flat board, around which the vulcanizer may be clamped or chained, as the case may be. If the wax paper is not at hand, sprinkle an even coat of tire talc over the space which the vulcanizer would cover. The tube is then ready for vulcanizing and the manufacturer's instructions as to clamping and the application of the heat have to be followed. Usually the vulcanizer is left on about 10 to 15 minutes after the heat begins.

If the cut on the inner tube is large, it is advisable to put a patch on the inside before applying the outer patch. This is a little more difficult job, but when such procedure is necessary the cut is usually large enough so that you can operate on the inside of the tube around the edges of the cut just the same as on the outside.

With some of the electric vulcanizers, time can be saved by bringing them up to the proper temperature, which is in the neighborhood of 270 to 280 degrees, while the tube or casing is being prepared. After it has reached its proper temperature and is clamped on to the tire, the job should be over in from 15 to 20 minutes.

STANDARD TIRE FABRIC TESTS

Washington, D. C., April 8—The bureau of standards of the United States department of agriculture has just issued a technologic paper on "Standardization of Automobile Tire Fabric Testing." The paper is written by Walter S. Lewis and Charles J. Cleary, who have conducted a series of experiments to determine what methods of making tests will admit of uniformity and standardization. In order that tests may have a value for comparative purposes. The chief causes of variation in test results have been considered and an effort made to establish a standard practice in conducting tests by each of the various methods and with the several kinds of testing machines. The experiments have had to do with dimensions of test specimens, moisture content of specimens at time of test, method of sampling, and lack of uniformity in material.

Wisconsin Truck in Two Models at $1,650 and $2,300

Were Formerly Built by Wisconsin Motor Truck Works; Now the Product of the Myers Machine Co.

The 1¼-ton Wisconsin truck with cab and windshield, selling for $1,750 as shown

THE Meyers Machine Co., Sheboygan, Wis., anounces the 1916 models of the Wisconsin truck which was formerly built by the Wisconsin Motor Truck Works. The new line consists of two models, a 1¼-ton and a 2½-ton.

In general the Wisconsin truck presents the modern ideas in truck design which have received the stamp of approval. The vehicle is long, low and quiet, which is accomplished by means of long, flat springs, shaft-drive with worm gears at the rear axles and medium size wheels and tires. This results in a low frame height and a low center of gravity.

The Waukesha motor is used in both models. Both are of the three-point suspension unit type, having large bearings and using four through bolts in all connecting rod bearings. The cylinders are water cooled by centrifugal pump. The placing of the valves on the right side together with left drive makes a very accessible motor. The transmission is securely bolted to the engine and incorporates a selective sliding gear and multiple disk clutch. The nickel steel gears and shafts of the transmission are built especially heavy and operate on ball bearings, selected to carry greatly in excess of the load placed upon them.

Semi-Floating Rear Axle

The rear axles used in the Wisconsin are of the semi-floating type with very large nickel-steel drive shafts, having a large overload capacity. The spring seats are cast integral with the axle housing which makes it possible and safe to take drive and torque through the springs. No torque arms or radius rods are used.

Both models have 56-inch tread, front and rear, which makes for easy traction on country roads. Front and rear springs are mounted solid on their front ends and shackled at the rear ends. They are of alloy steel, long and flexible. All shackle bolts are ground and provided with grease cups and all spring eyes are brass bushed, and easily replaced.

Brakes are unusually large in diameter and double internal which admits of the use of non-skid chains without the danger of their becoming caught in the brake arms or supports. The propeller shafts are of the tubular type with nickel steel tubing and universals. On the smaller jobs, two joints are used, while on the larger model a self-aligning bearing is carried on a frame cross-member, and three universals are employed. This allows of any length of wheelbase without a successive length of propeller shaft.

Frames of both models are of pressed steel, heat treated, and have insweep in front to allow short turning radius.

The 1¼-ton has a wheelbase of 136 inches. The motor measures 3½ by 5¼ inches and is governor equipped. Tires are 34 by 3½ in front and 34 by 4 in the rear. The length of frame back of seat is 9 feet 6 inches. This model sells for $1,650 and with cab and windshield, as illustrated is $100 extra.

The 2½-ton model has a wheelbase of 156 or 170 inches. The motor has a bore of 4 inches and a stroke of 5¾. Front tires measure 36 by 4 and rear, 36 by 6 or 36 by 4 dual, extra. The length back of the driver's seat is 11 feet 6 inches on 156-inch wheelbase or 12 feet 6 inches on the 170-inch wheelbase. This model, in the short wheelbase, sells for $2,275, and the long wheelbase, $2,300; cab and windshield $100 extra.

BIJUR BUILDING NEW PLANT

New York, April 8—The Bijur Motor Lighting Co., Hoboken, N. J., is erecting a fireproof twelve-story and basement addition to its plant, which will be 265 by 85 feet, giving 260,000 square feet of floor space. The construction is steel, concrete and glass and the building is located about 150 feet from the company's present plant, which will be continued. It is expected the addition will be occupied in July. Offices will be on the top floor and a progressive system of manufacture will be used, the materials passing downward until emerging as complete machines on the ground floor. There are two passenger and two freight elevators and a motor car elevator.

MICHIGAN SERVICE MANAGERS MEET

Detroit, Mich., April 7—Thirty members of the Automobile Service Managers' Association of Michigan were present at a smoker given by the organization at the Hotel Statler, April 1. General service matters were discussed, and it was the feeling that the service men must have the coöperation and help of the National Automobile Chamber of Commerce in the promoting of a standard service policy, such as has been suggested by the association.

Another meeting of the service men will be held April 11, at the same place, at which a standard repair parts policy will be discussed and acted upon. This will then be referred to the National Chamber with the hope that the latter organization will get behind it and seek to have it generally adopted. It is the general feeling that the meetings should be better attended and that all manufacturers should coöperate and take an interest in the work.

WILL MAKE YALE EIGHT

Saginaw, Mich., April 5—It is likely that the new concern, which will make the Yale eight, will be known as the Saginaw Motor Car Co. The capital stock is to be $250,000. The price of the car is to be $1,285. L. J. Lampke is the designer.

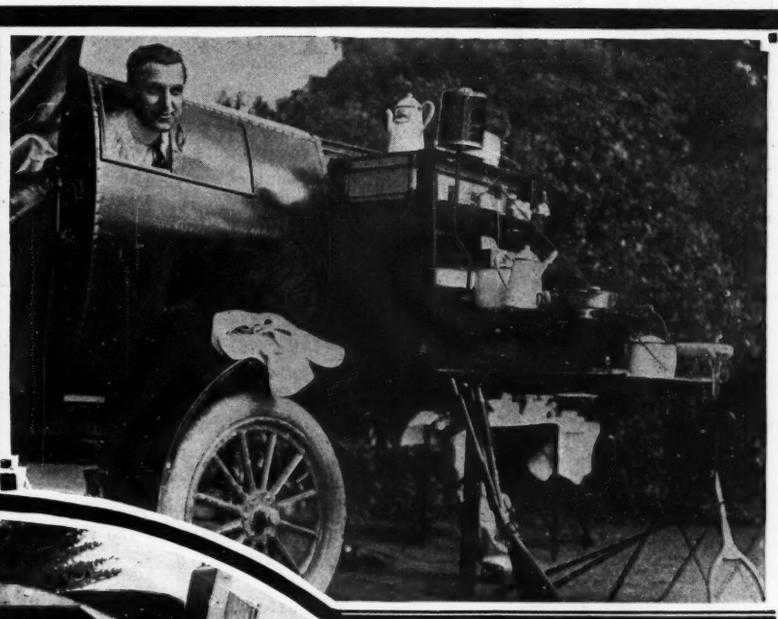
NIGHT SCHOOL FOR PAIGE MEN

Chicago, April 8—Night school for instruction in salesmanship is the plan being followed by Paige distributors and the larger dealers throughout the country, and the results already attained prove that this educational campaign is an important factor in increasing the effectiveness of the field forces of the company. It has been instrumental not only in making each Paige man a better individual salesman, but it also has been the means of unifying the organization and inspiring it with a unity of purpose and ideals.

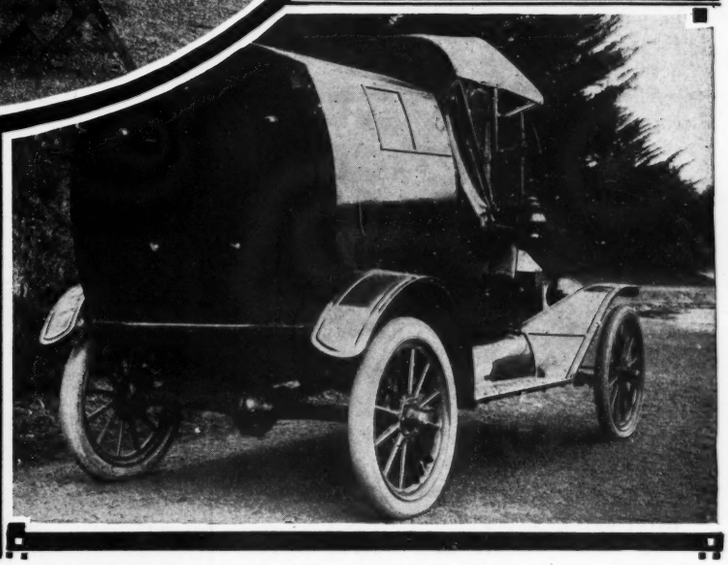
The Paige plan, however, is something more than the instruction of the sales force of each agency. It embraces every man in the employ of the dealer, from the office boy to the bookkeeper, the broad purpose being to fit each one, no matter what his job may be, to sell Paige cars, so that he may be able to serve a prospect intelligently whenever occasion arises. No customer need wait until a salesman comes in, if he arrives at an inopportune time. A stenographer or office man will be able to sell him as well as the dealer himself.

Telescope Apartment De Luxe for Motor Tourists

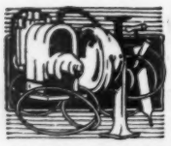
THE latest improvement in touring cars de luxe is the telescopic apartment. We have heard much of late of the palatial equipment of apartments on wheels, costing thousands of dollars each and the maintenance of which is beyond the means of a man of ordinary circumstances. The most modern hotel on wheels is so light that one man can lift it easily, can be attached or detached in 15 minutes, is but 3 feet 4 inches in length when telescoped and can be elongated to the dimensions of a very comfortable room, having as its main appurtenance a very comfortable bed with springs and mattress, attached in such a way when opened that they are convenient, and when packed for traveling fit together in a very small space. Conveniences include gasoline stove, many drawers for packing, racks for suitcases, clothing compartment, shower bath and dressing room equipment, cooking utensils and commissary space.



Above is shown the kitchen equipment of car and ventilator window in the telescope apartment, while at the left in the oval is given a more complete idea of the car as arranged for general camp purposes



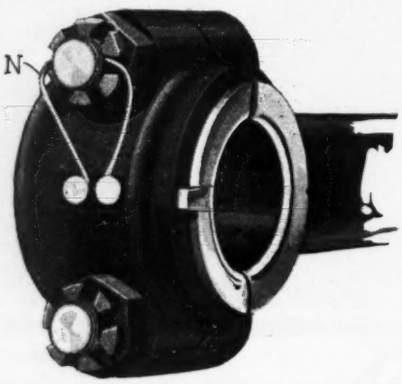
The conveniences of this telescope apartment are many. It enables one to carry all the equipment necessary for either week-end trips or long tours, and provides many comforts not possible in an ordinary car. At the left is shown how the bed is made up and at the right the car as it appears ready for its journey. Heat is furnished from the exhaust of the engine. While the illustrations herewith show the body attached to a Ford, it is made for attachment to any make of car. Carrying your home with you adds to the joy of motoring, and the tourist who does not have to make a certain place at a certain time must be equipped somewhat like the snail



The Accessory Corner

Buckbee Self-Adjusting Bearing

MEANS for automatically taking up wear is provided in the Buckbee self-adjusting bearing for motor crankshafts and connecting-rod big ends, which has been placed upon the market by the Self-Adjusting Bearing Co., Detroit, Mich. It



Buckbee self-adjusting bearing, shown in place

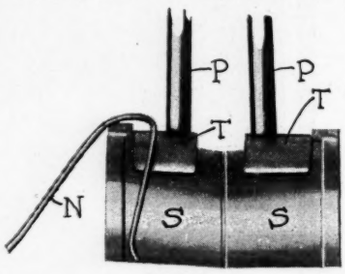
is particularly adapted to the connecting-rods and utilizes the principle of contracting on the shaft as wear occurs.

Referring to the illustrations, one shows a connecting-rod fitted with this new type of plain bearing, while the other gives the details of how the outer surface of the cap bushing is inclined and fitted with wedge-shaped segments, the combination acting to automatically set up the bushing to compensate for wear. The result is accomplished by forming the bushing of two halves, each half being slightly less than one-half the diameter of the shaft, so that they are slightly spaced apart when in place on the shaft. This is to allow for the automatic take up as the wear occurs.

The part of the bushing carried by the cap member is provided with two cone-shaped surfaces disposed at opposite angles, as shown at S. Fitting these surfaces and also the inner surface of the cap member are two similar segments T wedge-shaped in cross section and each fitted with a pin P. These pins extend through a slot in the cap, as indicated in the illustration. A spring N attached in some way to the rod end is so looped that one end engages each pin and thus tends to force the wedges up the inclined faces of the bushing. This movement of the wedges forces the cap part of the bushing toward the other part and thus takes up any wear.

Rives Safety Pedal

A rubber surface is presented to the driver's foot upon a pedal that is fitted with the Rives Auto-Pedal Never-Slip, which is intended to be a medium of safety by holding the foot from slipping when pressure is applied to the brake, while also lessening the shock and jar. Just as rubber heels on one's shoes absorb the little, sharp jolts of walking, the pad on the pedal obviates the tension of the muscles in holding the foot in position on a metal

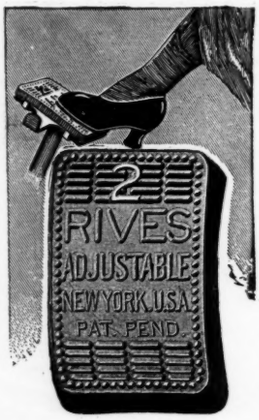


The adjusting contrivance of Buckbee bearing. This shows the inclined surfaces S and wedges T

surface. The pedals are sold in sets for all models of cars. The price per set is $1. This safety device is manufactured by the George H. Rives Mfg. Co., New York N. Y.

Milburn Four-Wheel Trailer

The Milburn Wagon Co., Toledo, O., is putting a four-wheel motor car trailer on



Rives safety pedal

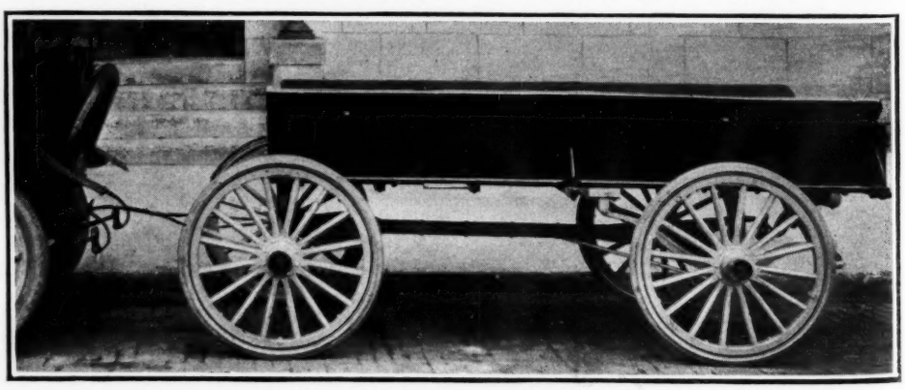
the market, known as the Milburn trailer, and designed along the lines of improved wagon construction. It has a frame body, with hickory frame, and cross-sills poplar panelled. The gear is the Milburn type of wood hound gear. The rear hounds are of second growth ash straight grained and bent to form. The gear parts are securely clipped. They are fitted with a short double turn fifth wheel pivoted back of the rear axle. The wheels are standard grade, Sarven type, 30 inches high, with channels, and 1⅜ rubber tire. The gear is equipped with ball-bearing axles. A model having a body 8 feet long and 45 inches wide is sold for $150, and a heavier size, with 10-foot body and heavier axles, at $200. Kibby & Pierce, motor car dealers, Toledo, O., are the distributors.

Luvium Metal Ford Pistons

Light-weight pistons of Luvium metal are now being made for Ford cars, in addition to other standard pistons, by the Whitman Luvinum Metal Co., St. Louis. Mo. This alloy was described in Motor Age of November 18, 1915. Luvium metal has a specific gravity of 2.67 to 2.70. Though having the lightness of aluminum, it is said to have a tensile strength greater than cold-rolled steel, or twice the tensile strength of cast iron. It is made in hard and malleable forms and has proven satisfactory for cylinders, connecting rods, gears, crankcases, sprockets, magneto parts and other uses, the wearing qualities being considered superior to steel by the manufacturer. The new Ford pistons, in sets of four, sell at $21 per set. They are equipped with Inland piston rings made by the Inland Machine Works, St. Louis, Mo.

Automatic Time Stamps

A simplified method of determining labor costs on time jobs in the repair shops, factory or garage, or in stamping time on office records, mail, etc., is provided by the Baird Tempograph, or the Baird Arrowgraph, which are automatic time stamps. These devices are manufactured by the Baird Equipment Co., Chicago. The Tempograph will record the date, and the starting and finishing time, and will automatically figure up and register the exact



The Milburn motor car trailer

period of time elapsed, down to any fraction of the hour or minute. It performs much of the work done by a cost clerk. One machine will simultaneously care for any number of different tickets for any number of workmen. Prices for the different sizes vary from $3.50 for the pocket size to $75 for one of the more elaborate models.

Voss Auto Watch

The Voss auto watch attaches to the spring bracket. It may be set at any angle desired. No screws or bolts are required and it can be put in place quickly. It may be wound while the car is in motion. A new watch may be obtained and secured in the case to replace an old or damaged one. They are made by the Voss Auto Watch Co., Des Moines, Ia., and sell at $2.

Detachable Power Transmission

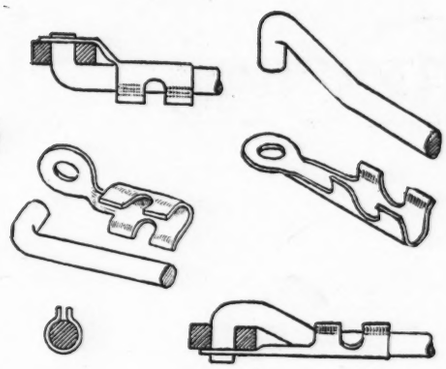
A detachable power transmission with flexible shafting and pulley for belt drive, the purpose of which is to permit the use of a motor car engine in supplying power for other purposes in garages or elsewhere, has been designed by Edward Hanson, Cleveland, O., and patent applied for. It consists of a standard and bearings for holding a shaft which may be attached to the front end of the engine shaft. As the shaft between the bearing and coupling is flexible, the fact that the engine shaft may be out of line with the transmission shaft, or the engine lower by reason of the tires being deflated, will have no effect on the operation of the apparatus. Instead of a belt drive, the shafting may be directly connected to the dynamo, lathe or machinery which it operates.

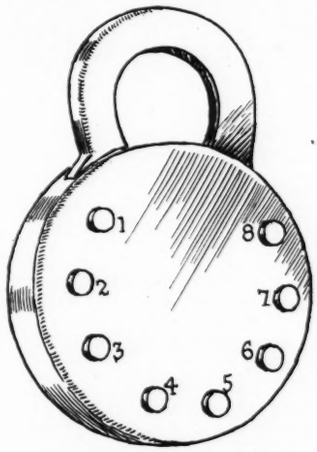
Cylinder Scoring Cure

In order to avoid the necessity for reboring or regrinding cylinders, which are slightly scored by loose pistons or loose wrist pins, a new process is coming into growing use. The scores in the cylinders are filled with a nickel composition which is smoothed down to the inner wall of the cylinder allowing the same pistons and rings to be used. The composition becomes a unit with the iron of the cylinder, according to the manufacturers of the compound, and is permanently welded in place, although it is hard when applied. In working with this composition not enough heat is applied to warp the cylinder walls and therefore the necessity for reboring and regrinding is eliminated. The Wilkes-Barre Welding Co., Wilkes-Barre, Pa., is making a specialty and, by means of the process, is enabled to turn out work the day after it is received. The cost of work of this nature is quite low, being $5 for bore up to 4 inches, and $7 for over 4-inch bores. By the same method repairs can be made on complicated brakes in crankcases, cylinders, housings, etc., when made of cast iron, steel or aluminum.

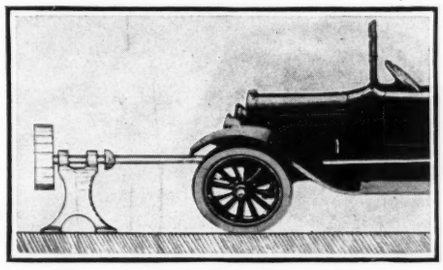
Voss motorist's watch

This shows the component parts of the Pelton clip, which is a substitute for cotterpins





No-Key motor lock



Detachable power transmission

No-Key Motor Lock

The No-Key motor lock is so constructed that a gentle pressure on certain of the eight buttons shown in the illustration, as called for by the combination of each particular lock, opens the hasp. It does not require the use of a key. There are 40,000 combinations possible. The combination may be changed as often as desired. Some of the buttons push down and some up and the lock may be operated easily with one hand. It is made of brass and bronze. There is no iron or steel about the lock to rust and impair its operation. The locks are useful for protecting garages, cars, tool boxes, spare tires and for general purposes. Packed in an individual carton, one lock weighs 5¼ ounces. The price is $1.50. It is manufactured by the American Keyless Lock Co., Chicago. The Kapp Specialty Sales Co., New York, is the distributor.

Elgin's Motor Power

A liquid compound for mixing with the gasoline supply for a motor car or stationary gasoline engine is sold under the name of Elgin's motor power by the Elgin Motor Power Co., Cedar Rapids, Ia. It may be used simply by adding it to the gasoline in the tank. It is guaranteed not to contain any acid or ingredient that would injure any part of the motor or equipment. The manufacturer declares it cuts the carbureter down to a lower mixture and increases the mileage per gallon of gasoline from 10 to 20 per cent, and that it will soften and remove carbon from the motor. It sells at $1.50 per can.

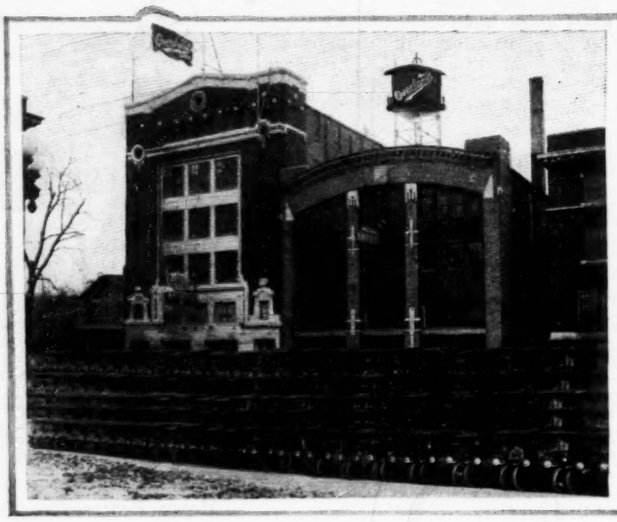
Shi-Nup Enamel Cleanser

Shi-Nup, for the motor car uses, is not a polish in the ordinary sense of the word, but a cleanser, according to descriptions by the manufacturer, the Shi-Nup Corp., Yonkers, N. Y. It does not re-surface the part to which it is applied, nor leave a covering of wax, oil or grease. It contains no acids or combustibles. The manufacturer says it will restore the original luster of the finish. It is adapted to use on fenders, hoods and parts finished under heat treatment. A quart is said to be a large enough supply for a season. It is sold in quart cans at $1, and in pint cans at 50 cents per can. Rose & Hibbard, Yonkers, N. Y., are the wholesale distributors.

Substitute for Cotter Pins

The Pelton clip, illustrated on this page, was originally designed to connect the throttle-operating rod to the throttle lever. The device has been patented by C. S. Pelton, of the Perfection Spring Co., Cleveland, O., and is being put on the market by the Burns & Bassick Co., Bridgeport, Conn., it being a practical substitute for cotter pins in many cases. The Pelton clip when utilized for its original purpose renders it unnecessary to drill the throttle-operating rod for a cotter pin. The clip is cut from sheet steel and the tongues bent up in a position nearly parallel. To apply it, the tongues are simply brought together with a pair of pliers. Two types of clips are shown in the illustration.

From the Four Winds



STORING cars has been done in various ways, but no system has been developed that is quite so unique as that shown in the illustration at the left. Of course, this is only a demonstration of the initiative of the camera-fiend, but offers an interesting picture even if improbable, or impossible in actual practice. The photographer has piled four rows of cars on top of another row

CATTLE Cars for Motor Shipments—Railroad freight cars must indeed be scarce. The Meloy Motor Co., Globe, Ariz., has recently received several shipments of Studebakers in cattle cars.

Traffic Officers in White Coats—Traffic patrolmen of Kansas City, Mo., have been furnished white rubber coats, caps and gloves for wear on rainy and misty days. It is intended to make the crossing patrolmen more discernible on dark days.

Motor Cars Cut Street Car Profits—Superintendent West of the street railway company at Galesburg, Ill., stated that motor cars are responsible for a decline of 116,692 passengers in 1915 as compared with 1914, representing a loss to the company of $5,570.

Ontario Offers Reciprocity License Plan—Ontario has put forward a plan of reciprocity in motor car licenses of the United States. The necessary legislation was introduced in the house recently by Hon. Finlay Macdiarmid among a number of other amendments to the Highways act. The reciprocity provision states that this privilege may be extended to any person who is a resident of the United States who has complied with the provisions of the law of the state in which he resides as to the registration of motor vehicles.

Speed Rules for Motor Stages—Motor stages in Arizona must not approach street car or railroad tracks at a speed of more than 4 miles per hour, and at such times must be kept well under the control of the driver. This order was issued by the state corporation commission following an investigation of a collision between a Phoenix streetcar and a motor stage. The evidence showed that the stage was being driven at an excessive rate of speed on a muddy street and that the driver was unable to bring it to a stop when he saw the car.

Test Ordinance Affecting Minors—The validity of an ordinance forbidding children under 16 years of age to drive motor cars in Knoxville, Ill., will be tested at the June term of the Knox county circuit court. A son of Albert Dempsey was arrested, charged with violation and his father has appealed the case from the justice court. This is said to be the first instance where a test case has been made. It is expected that the controversy will be taken to the supreme court in order to determine the authority of a city to make such a restriction, thus establishing a precedent which will be of importance to all other cities of the country.

Those Reckless Jitney Drivers—A woman at Camden, Pa., called the mayor of McKeesport, Pa., by telephone to complain of bus drivers in her vicinity. She declares they speed and "carry on" in an undesirable manner. The mayor of McKeesport has no jurisdiction outside that city, but he is considering the complaint in connection with a jitney ordnance now being drawn up for McKeesport.

Helps for Canadian Tourists—The directors of the Montreal Automobile Trade Association, Montreal, Que., have decided on a campaign that will be of interest to the motor tourist. Any motor car owner can become an associate member. A fee of $2 per year will be charged. Arrangements are now being made to affiliate with clubs in the United States. A list showing the best hotels and garages is being compiled.

High Mark for Wisconsin Licenses—A total registration of 51,000 motor cars by private owners at the close of business March 31 is the unprecedented record of the state of Wisconsin. A year ago the total registry for the first quarter of 1915 was slightly under 30,000, showing a gain of 21,000 or 70 per cent. Although the department of state planned on a registration of only 100,000 for 1916, predictions are freely made that the number will run up to 115,000 before the end of the year.

One Driver in Ten Passes Examination—Among 120 persons who were applicants for drivers' licenses under the laws of Minnesota, only twelve were successful in passing an examination held a few days ago, while two others were conditioned, dependent on their skill in practical driving tests to be held later. These road tests have been added to the requirements for obtaining a drivers' license as a desirable aid in weeding out the incompetent ones among the applicants.

Ohio Issues 121,000 1916 Licenses—According to a report made by W. H. Walker, Ohio state registrar of motor cars, covering the present year up to and including March 28, the department has issued 121,000 licenses to gasoline motor car owners in the state since the first of the year. It was late in May last year when that number was reached. The department has been keeping separate records of dealers' and electric owners' licenses, which make the totals larger than that figure. Up to date there have been 2,361 licenses issued to dealers and 7,983 licenses to owners of electric cars.

Mounted Orderlies Become Chauffeurs—Members of the mounted orderly section of the Second infantry, Wisconsin National guard, are to be instructed in running motor cars as well as riding horseback.

Jitneys Charge Two Jitneys for Ride—The jitney men who have been operating cars between Moline, Ill., and Rock Island, Ill., for 5-cent fares, have been compelled to increase the rate to 10 cents. If the public fails to respond to the 10-cent fare, the jitneys will go out of business. All have been losing money of late, and the increase in fares became imperative. It is predicted the fickle public will prefer the street cars at 5 cents.

Traffic Congestion an Acute Problem—Traffic has become so congested in Wilmington, Del., in the streets that are devoted to curb markets, that a law has been enacted by the city law-makers declaring it an offence, punishable by fine, to drive south on those streets during market hours, from 7 o'clock in the morning until 2 o'clock in the afternoon. Rigid enforcement of the law has caused so much hardship, especially to non-residents, that the traffic regulations have been amended so as to permit warnings to be given for first offences.

One Light Not Enough—If the action of the police judges of the municipal courts of Kansas City, Mo., produces any effect, the practice of burning but one light on motor cars will soon end. The local magistrates have declared their intentions of fining all persons brought before them on that charge. Fines will also be levied for using movable spotlights. The judge of the south side court, Norman Woodson, is particularly incensed with the carlessness of some of the drivers and intends to do his share towards the Safety First propaganda.

Locking Ordinance To Be Enforced—The police department of Detroit, Mich., has announced that the locking ordinance which was adopted by the city council last year, and until now disregarded, will be enforced in the future. During 1915, according to the police records, 1,391 motor cars were reported missing in the city. It is claimed that if they had been locked the cars would

not have been taken away. All motor cars parked in the streets during the day will from now on be inspected by police officers, especially with regard to tail and side lights, horns, or other signaling devices.

Motor Car Sounds Fire Alarm—Firemen who answered an alarm from a box on a Chicago street corner a few nights ago are looking for a motor car with an Indiana number. When the firemen arrived at the call box they found it broken down. Neighbors said an Indiana motor car wrecked the box.

Tacks and Speed Laws—When a man gets a tack in his tire he is justified in violating traffic ordinances if by so doing he can get to a garage or repair shop in quicker time or with less injury to the tire. Such was a ruling last week in the police court at Hiawatha, Kas. Sam Miller, a Robinson real estate man, had violated the Hiawatha traffic ordinances under these conditions, and was acquitted at his trial on proving that he had this valid reason for violating the ordinances.

Good Roads Activities

Oiling a City's Streets—The city of Milwaukee expects to apply 350,000 gallons of road oil to its macadam streets during 1916.

Annual Good Roads Day—Governor Brumbaugh, of Pennsylvania, has issued a proclamation designating May 25 as "Good Roads Day" in the Keystone state. This is to be the second event of its kind in that state.

Re-Naming a Lincoln Way Boulevard—The city council of Oakland, Cal., has before it a proposal that the name of Foothill boulevard, one of the city's most noted drives, be changed to Lincoln boulevard, this being desirable because it forms a part of the Lincoln highway.

Paved Way Between Two Ohio Cities—Contracts for missing links in roads connecting Canton, O., with Akron, O., and Wooster, O., will be let April 7 by the Ohio highway department. At that time the state department will let the contract for 2.29 miles in Summit on the Canton-Akron and 5.83 miles in Wayne on the Canton-Wooster. The contract for about 5 miles on the Canton-Akron road probably will be let April 21.

Milwaukee-Chicago Route Gets Boost—Good roads boosters representing Chicago, Waukegan, Kenosha, Racine and Milwaukee have fixed the dates of May 14 to 20 as "Sheridan Road Week," during which a concerted effort will be made to pledge the final completion of a permanently improved lake shore highway connecting Milwaukee and Chicago, a distance of 85 miles. Milwaukee county has but ½ mile of concrete road to build; Kenosha is completing its share this year, and Racine county will finish before the summer of 1917.

Kentucky Inter-county-Seat Roads—The activities in road building during the year 1915 throughout the state of Kentucky have surpassed anything that has happened during the last decade along this line, and is due largely to the passage of the state-aid road law and the campaign that has been constantly waged by the department of public roads and the press of the state, and the efforts of the Kentucky Good Roads Association for the putting into effect of the new system of road construction. A good beginning has been made on the inter-county system which, when completed, will connect the county seats of adjoining counties, and also the county seats of adjoining counties in adjacent states. The system will comprise about 6,400 miles of road. More than 800 miles of road have been constructed or reconstructed. Only ninety counties were at work during last year, while it is expected that all of the 120 counties will be working during the approaching season. When the intercounty seat system is completed it will take care of approximately 80 per cent of the traffic of the state, and the neighborhood roads can then be constructed to feed into the main roads. As fast as the neighborhood roads are completed the system will be extended and widened until each citizen has a good, hard-surfaced road all the way from his gate to the towns and cities.

Trans-State Road Under Construction—Work has been commenced on the Oregon trans-state highway, which traverses the John Day River valley. This route connects on the east near Ontario with the Lincoln highway and on the west with the Columbia River highway near the Dalles, covering a distance of 350 miles.

Spends $1,800,000 on Roads in 3 Years—Milwaukee county, Wis., which now ranks with Wayne county, Mich., as the greatest concrete road district in the world, spent $1,826,067 in permanent highway improvement during the period from 1912 to 1915 inclusive, according to a compilation just made by the county highway commissioner. In the 4 years more than 50 miles of concrete roads were constructed and 33 miles are being built in 1916.

New Approach to Atlantic City—Atlantic county freeholders having appropriated $200,000 to go with the state's gift of $80,000, work will soon be started on the new boulevard across the meadows from Absecon to Atlantic City. This new road will begin at the junction of the White Horse pike and the Shore road, main highways from Philadelphia and New York respectively, and will go direct into the "City-by-the-Sea," eliminating the present longer run through Pleasantville. Pleasantville justices and constables have waxed fat on fees and fines paid by speeding motorists, but with the opening of the new road this source of supply will be closed.

Snow Delays Connecticut Road Work—The work of the Connecticut state highway commission is somewhat backward this season by reason of the heavy snows. There is considerable work to be done. From North Haven to the state line north there is considerable snow.

Nineteenth Florida Roads Meeting—The Florida Good Roads Association, during its nineteenth annual convention at St. Augustine, Fla., during the last week of March, submitted to the president of the association, F. O. Miller, a report and recommendations in which the matter of federal aid for road construction is left an open question. This is the context of the paragraph relating to the subject of federal road appropriations: "Which of the bills providing for federal aid for road building, now pending in congress, shall this association endorse?"

Coming Motor Events

CONTESTS

May 6—Sioux City, Ia., Speedway race.
May 13—New York, Sheepshead Bay speedway race.
*May 20—Chicago speedway amateur's race.
*May 30—Indianapolis speedway race.
May 30—Tacoma, Wash., speedway race.
May 30—Minneapolis, Minn., speedway race.
*June 10—Chicago speedway race.
June 28—Des Moines, Ia., speedway race.
July 4—Minneapolis speedway race.
July 4—Sioux City speedway race.
July 4—Track meet, Coeur d'Alene, Ida.
July 15—Omaha, Neb., speedway race.
July 15—Track meet, North Yakima, Wash.
August 11-12—Hillclimb, Pike's Peak, Colo.
August 5—Tacoma speedway race.
August 18-19—Elgin road race.
September 4—Indianapolis speedway race.
September 4—Des Moines, Ia., speedway race.
September 4-5—Track meet, Spokane, Wash.
September 16—Speedway race, Providence, R. I.
September 29—Track meet, Trenton, N. J.
September 30—New York, Sheepshead Bay speedway race.
October 7—Philadelphia speedway race.
October 7—Omaha speedway race.
October 14—Chicago speedway race.
October 19—Indianapolis speedway race.

*Sanctioned by A. A. A.

CONVENTIONS

June 12-16—S. A. E. annual cruise, Lake Huron and Georgian Bay.
May 9-12—National Asso. of Automobile Accessory Jobbers, spring meeting: Hot Springs, Va.
May 19—A. A. A. annual meeting, Washington, D. C.

Clubs and Associations

Cincinnati Club's Election This Week—The annual election of the Cincinnati Automobile Club is scheduled for April 15. Dr. C. L. Bonifield will probably succeed himself as President.

Dallas Enlists 1,200 More Members—As a result of the campaign in Dallas, Texas, for new members for the Dallas Automobile Club, more than 1,200 new members have been secured. This club has one of the handsomest parks in the state.

Brainerd Auto Club Officers—The Brainerd Auto Club, at Brainerd, Minn., at its annual election, one week ago, elected the following officers for the ensuing year: J. F. Woodhead, president; Clarence Olson, vice president, and C. E. Hansing, secretary.

Illinois Clubs Publish Signal Code—The motor clubs of Rock Island, Moline and Davenport, Ill., have formulated a code of signals which will be published and distributed to all motor car drivers and posted in public places.

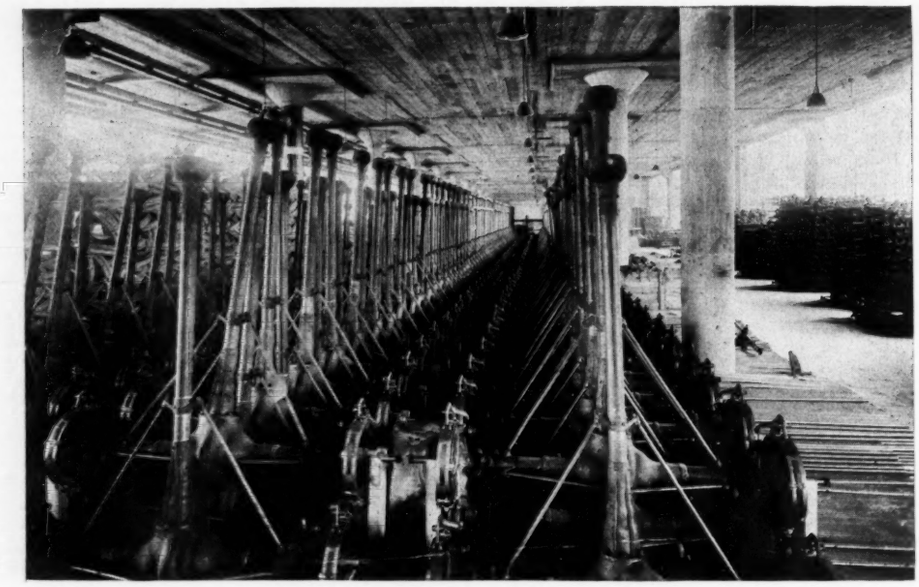
Shriners Have Motor Club—A motor club of Shriners is the newest thing in social and motoring circles in Iowa. A club of this character has been organized within the membership of the Za-Ga-Zig temple at Boone, Ia. Already there are 110 members and other Shriners are joining rapidly.

Annual Meeting at Davenport, Ia.—The annual meeting of the Davenport Auto Club, Davenport, Ia., will be held April 4. Several important subjects, among them a consideration of the Blackhawk Trail, will be taken up. The progress of work on the De Sota highway, the oiled road from Davenport to St. Louis will receive attention.

Christening of "Optimism"—The new Omaha Auto Club sign car made its debut on the streets of Omaha, Neb., and was christened "Optimism." Chairman Gould of the road sign committee drove Optimism down to the directors' meeting. A gallon of gasoline in which a handful of application blanks was thrown, was broken over the hood.

Spring Is Toledo Club's Busy Season—The Toledo Automobile Club, Toledo, O., has started several lines of activity with the coming of the spring touring season. The club is coöperating with the Wayne-Highway association for the improvement of roads in northwestern Ohio. The club is also preparing a campaign against persons throwing broken glass and other sharp articles on the streets and roads and a special force of officers will be named to secure the enforcement of the ordinance.

Among the Makers and Dealers



A STOCK OF PAIGE REAR AXLES—In the motor car world the battle between demand and production still rages and peace is not in sight. Indeed as spring arrives the intensity of the attack is redoubled and prospective owners who expect to capture cars must step very lively. At the factory of the Paige-Detroit Motor Car Co., Detroit, Mich., production activity is reaching its height and the large shipments of cars being made every day are rapidly making dents in the accumulation of orders that for a while threatened to swamp the company. How the Paige business has developed and what the filling of the orders for these cars means is indicated somewhat in the illustration above. That strange looking jungle of weird machinery is just a bit of stock that a few hours after the camera clicked rolled out of the factory in Paige cars. It consists of a few Paige rear axles.

LEE Tire Plant Expansion—Plans and specifications were completed this week for a large new mill to expand the plant of the Lee Tire & Rubber Co., Conshohocken, Pa.

L. D. Haas Joins Monroe Firm—L. D. Haas, who was sales manager of the Chevrolet Motor Co., has been appointed to a similar position with the Monroe Motor Co., Flint, Mich.

Liberty Company Engages H. L. Buller—H. L. Buller, formerly with the advertising department of the Apperson Bros. Co., and the Oakland Motor Car Co., has been appointed advertising manager of the Liberty Motor Car Co., at Detroit, Mich.

P. W. Tracy Enters Premier Employ—P. W. Tracy has accepted the directorship of purchases and stores of the Premier Motor Corp. He has been associated with the Paige-Detroit Co. heretofore in the same capacity.

G. H. Williamson Joins Wisconsin Firm—G. H. Williamson of Cincinnati, formerly associated with the Maxwell Motor Co., Detroit, as district manager, has accepted a position in the sales department of the Four Wheel Drive Auto Co., at Clintonville, Wis.

Wisconsin Garage Men Re-organize—The Wisconsin Garage Men's Association is the new name of the organization originally formed as the Wisconsin Automobile Business Association. The society was formed two years ago. The association included garage keepers, repairmen, dealers, supply men, tire people and all branches of the industry. The garage keepers were dissatisfied with the plan. Other members of the Business association then decided to turn over the society to the garage men and withdraw voluntarily. The Wisconsin Garage Men's Association will be affiliated with the American Association of Garagemen.

Rubber Specialties Firm Enlarges Plant—The Chicago Rubber Clothing Co., Facine, Wis., is about to build a $12,000 addition to its plant to enable it to take care of its largely increased business. The company manufactures numerous motoring specialties and clothing for motorists.

Gillette Tire Factory Soon Ready—The Gillette Safety Tire Co., Eau Claire, Wis., has awarded contracts for the erection of its new factory, foundations for which were laid during the winter. The company was organized last fall by R. B. Gillette. It is hoped to be able to start actual production by July 1.

Cole Has Australian Distributor—Chipman, Ltd., of London, England, a concern of international reputation, with branches in Australia and New Zealand, will in the future represent the standardized plant and handle the entire Cole line in these two British colonies. Through the arrangement with the British concern, the Cole Motor Car Co. will have dealers in Sydney, Melbourne and Perth, Australia, and in Wellington, New Zealand.

Restrictions on Dealers' Licenses—That motor car dealers cannot operate their machines outside their garages on dealers' licenses without violating the law was the opinion expressed by Secretary of State Charles D. Burnes at a hearing given to John L. Carpenter of Bridgeport, Conn. The secretary says he thinks the law is too stringent and should be changed by the next legislature. Meanwhile, he said, the dealers must, like Steve Brody, take a chance. He also said he intended to enforce the law to a reasonable extent and conduct a crusade against those dealers who rent or loan their trucks bearing dealers' licenses. The company owns 1,000 touring cars and taxicabs. The value of the assets is not given but the liabilities are set down as $400,000.

Larger Factory for Standard Trucks—The construction of a new factory for the Standard Motor Truck Co., Detroit, Mich., manufacturers of Standard trucks, will begin shortly. The cost of the building will be in the vicinity of $100,000, and the machinery will cost approximately $100,000.

Chalmers Plant for California—The Chalmers Automobile Co. has decided upon Oakland, Cal., as the location of a large assembling plant and factory for light manufacturing. It will take care of all the Chalmers business on the Pacific Coast, which is now estimated at from 7,000 to 8,000 cars per year. This is the second large Eastern motor car concern that has located in Oakland within a month. The foundations for a $1,000,000 plant for the Chevrolet company are now being laid.

Electrical Company Reorganizes — The Kemco Mfg. Co., Cleveland, O., has undergone a complete reorganization recently. This company is engaged in the manufacture of lighting and starting equipment. C. A. Burrell, who has been connected with the Willard Storage Battery Co. for a number of years in the capacity of credit and advertising manager, has resigned his position with that company to accept the secretaryship and general managership of the Kemco company. The officers are: Frank W. Glass, president; E. M. Silver, vice-president; A. O. Silver, treasurer. The directors of the new

organization will be the four officers mentioned, in addition to H. E. Silver, also of Salem. Under the reorganization of the Kemco company, none of the old officers or directors are connected with it. The company will specialize in the manufacture of starting and lighting equipment for Ford cars, which equipment they have been making for some time.

Manufacture Tires at St. Louis — The Union Tire & Rubber Company, St. Louis, Mo., incorporated in Delaware, has been authorized to use $400,000 of the $500,000 capital in manufacturing operation in St. Louis. E. G. Stearns, of Chicago, is largely interested.

Currier Lang Accepts New Post—Currier Lang, chief of the civil engineering department of the Solvay Process Co. during the last eight years has resigned to become assistant general manager of the Detroit Gear & Machine Co., Detroit, Mich., manufacturer of motor car transmissions and clutches.

O. B. Henderson Leaves KisselKar—O. B. Henderson, Los Angeles, Cal., who for 2 years has been vice-president of the Pacific KisselKar branch and manager of the Los Angeles plant of that concern, has resigned. His place will be filled by Col. C. L. Hughes, formerly with the KisselKar interests at Oakland, Cal.

Duesenbergs Make Aeroplane Motors—The Duesenberg Motor Co., St. Paul, Minn., is making aeroplane engines in addition to manufacture of the Duesenberg car. The Gallaudet Aeroplane Co., Norwich, Conn., has ordered the motors, which are 130-horsepower, four cyclinder engines. The company is making also a twelve-cylinder motor for the Canadian government.

Southern Cadillac Dealers Meet—Cadillac dealers from Missouri, Kansas, Oklahoma, Texas and parts of Louisiana and Arkansas gathered in Dallas, Texas, a few days ago to attend the first annual meeting of the Southwestern field representatives of the Cadillac Motor Car Co. While here the representatives were the guests of R. L. Munger, Cadillac representative in Dallas.

Inglis Mfg. Co. Starts Business — The Wallman Mfg. Co., manufacturer of gasoline and oil storage systems, tanks and pumps, Milwaukee, Wis., has been succeeded by the Inglis Mfg. Co., a newly organized concern of which C. W. Inglis of the Milwaukee Steel Foundry Co. is president and treasurer. Charles Inglis, for 28 years with the International Harvester Co., Milwaukee branch, is secretary and manager. It is the intention of the new concern to improve and largely increase the production of garage systems.

Hyatt Branch at Seattle—The Hyatt Roller Bearing Co. has established a service branch at Seattle, Wash. This raises the number of Hyatt district branches to ten. The new branch is in charge of D. B. Bevier, former service manager of the company's branch at Los Angeles, Cal. He has also been made district manager of all the Hyatt branches on the coast. J. J. Hanrahan, formerly service manager at San Francisco, has been transferred to Los Angeles and F. B. Brunton has been made service manager at the Frisco Branch.

Mineral Oil Plant in Operation—The Pittsburgh Industrial Development Commission announces the location at Pittsburgh of a new industry, the Wonder Oil Co. The company has a paid up capital stock of $100,000. It is the outgrowth of an experimental plant that was established in Detroit, Mich., for several months under the direction of F. R. Hemenger and B. G. Desmond. The company manufactures a mineral oil that is said to be the first oil ever produced that will blend satisfactorily with gasoline and is susceptible to a very high fire test. The officers are: President, Joseph R. Orr; vice-president, James C. Clow; secretary, R. E. Miles; treasurer, James D. Orr. A new plant has been acquired and is being operated at its capacity.

Stutz Using Remy System—For the third consecutive season Stutz cars will be equipped with Remy starting and lighting.

H. A. Lozier Co. Increases Capital—The H. A. Lozier Co., Cleveland, O., has increased its capital from $10,000 to $700,000.

Payroll of Flint, Mich., Going Up—During the first half of this month $674,110.66 was paid to the employes of twenty-one manufacturing concerns of Flint, Mich., of which fifteen make either motor cars or parts and accessories. Four concerns, the Buick, Chevrolet, Weston-Mott and Mason companies, paid out $40,000 more than during the second half of February.

Receiver for Taxicab Company—The Mason-Seaman Transportation Co., one of the large taxicab companies in New York City, has been placed in the hands of receivers. Lowered taxicab rates and the present high cost of gasoline figured prominently in the reasons given for the failure of the company. The company is capitalized at $10,000,000 and was organized in 1914 to take over the Mason-Seaman Transportation Co. and the Yellow Taxicab Co.

Shipping Facilities a Problem—In an endeavor to get some idea how soon they could get deliveries of cars, and in what manner the freight shipments were being handled at the factory a party of 80 Overland and Willys Knight dealers from Boston and New England made a special trip to the factory. As a result of the Boston show they had booked many orders, and one trainload of 102 machines that got through 2 weeks ago was distributed in 24 hours. So the freight shipments are worrying the Overland men.

The Show Circuit

New Haven Show to Be Annual Event—The success which attended the motor show held in New Haven, Conn., the third week in March, has resulted in a move among the local dealers to make it an annual affair.

Motor Show Auditorium Needed—The Lexington Leader, Lexington, Ky., has started a campaign to raise funds for erecting a municipal auditorium at Lexington, in which future motor shows and similar events may be held. The newspaper has agreed to subscribe $5,000 and individual stockholders in the Leader company an additional $10,000. The motor show was held this year in a tobacco warehouse on the outskirts of the city.

Milwaukee's Spring Show This Week—Every piece of mail issued by Milwaukee motor car dealers contains slips and bills advertising the second annual spring show, April 11, 12 and 13. The event has been officially designated as the "Dealers' Show Room Motor Car Display." The Milwaukee Automobile Dealers, Inc., which is promoting the exposition, is also using liberal newspaper space to advertise the event. The association is composed of thirty-five of the leading dealers of Milwaukee, who are agents for a total of fifty-eight makes of cars. The thirty-five dealers' salesrooms, where the exhibits are shown, are splendidly decorated.

20,000 Elgin Sixes Next Year—The Elgin Motor Car Corp., Chicago, plans a production of 20,000 Elgin sixes next year. Deliveries are being made from the temporary factory at Argo, a suburb of Chicago, while the big new plant there is under construction.

Car Shipments Via River Boats—There is some relief in sight for Hartford motor car dealers who have felt the effects of the freight embargo on the New Haven railroad. River navigation was resumed April 3. The Hartford boats run to New York and are much in favor in season. They are operated by the New Haven railroad system.

Dealer's License Cause of Fine—Samuel Silbert, judge of the municipal court at Cleveland, O., assessed a fine of $10 and costs against Charles Ramsberger last week, on the charge of using a dealer's license for other purposes than demonstrating cars. It is said the courts intend to make a crusade against this practice.

Companies Join Hands to Build Mill—An agreement has been filed in the courthouse at Lancaster, Pa., in which the Hyatt Roller Bearing Co., proposes to equip a mill there for the New Process Steel Co., located on the outskirts of the town. It will cost $50,000 and it is agreed that in return the Hyatt concern will receive the products of the steel company until the amount has been covered.

R. S. Beane with Mattson Rubber Co.—R. S. Beane, for many years associated with tire manufacturing companies, has formed a connection with the Mattson Rubber Co., of Lodi, N. J. Mr. Beane will be this company's special representative and will begin interviewing the larger dealers at once. The plant of the Mattson Rubber Co., is running three shifts in an endeavor to keep pace with orders.

Packard's March Business $1,000,000—"A million in a month" is the announcement made by the Packard Motor Car Co., Detroit, Mich., in publishing the result of its domestic motor truck business for March. On the morning of April 1, orders calling for trucks to the value of $1,000,530, indicated the total business for the previous month. Not a single foreign order was included in the total. More than 99 per cent of the amount was for truck chassis. A majority of the buyers ordered bodies built by outside concerns.

Tractor Firm Starts Production — The Klumb Engine & Machine Co., organized last fall at Sheboygan, Wis., to manufacture motors, tractors, etc., is now ready for a regular production of a general utility gas tractor for agricultural purposes. As a plow, the Klumb tractor does the work of nine horses and three men. It may also be used to drive ensilage cutters, silow fillers, pull stumps, do road work and a hundred and one other things. The company has been able to get sufficient material to insure a considerable production.

Wyman & Gordon Co. Has Reorganized—The Wyman & Gordon Co., Worcester, Mass., manufacturer of drop forgings for the motor car trade, has reorganized with a capital of $3,000,000, and has changed its named to Wyman-Gordon Co. This reorganization does not mean any change in the policy of the company, but incorporates new interests represented by Robert F. Herrick, Boston, well known in business and financial circles because of his large investments in varied lines. Large factory extensions are under way. The control and management of the company will continue with those who have been associated with it. The of-

ficers are: George F. Fuller, president; H. G. Stoddard, vice-president and treasurer, and Charles C. Winn, assistant treasurer.

Saxon's Biggest Day—The Saxon Motor Car Co., shipped 179 Saxons from Detroit, Mich., on March 16, which is the biggest day the company ever had.

Jacksonville, Fla., Has New Association—Garage men and motor car accessory and supply dealers of Jacksonville, Fla., have organized an association which will undertake the task of standardizing the supply and accessory business in that city.

Spoke and Wheel Factory Enlarges—The Bimel Spoke & Wheel Co., Portland, Ind., is extending its plant by the addition of six large kilns for the final seasoning of spokes and felloes. This will provide sufficient capacity for a daily production of 400 sets of pleasure car wheels and fifty to 100 sets of truck wheels.

W. H. Krueger Owns Milwaukee Cole Branch—W. H. Krueger, who recently went to Milwaukee to assume charge of the Cole company's distributing branch in that city, has purchased outright the Milwaukee business, and is not now connected with the Cole Motor Co. of Chicago, as was erroneously stated in Motor Age.

Omaha Association May Re-organize—A new organization, at Omaha, Neb., which will probably be known as the Omaha Automobile Dealers' Association, is expected to supersede the Omaha Automobile Association, the purpose of which has been for the most part to promote the annual automobile show, without particular regard for the particulars of the dealers' welfare.

Dividend to Bowser Employes—It has been announced by the management of the S. F. Bowser Oil Tank & Pump Co., Fort Wayne, Ind., that all employes of the plant will receive a dividend of 6 per cent on their wages for the month of February. It was stated by President Bowser that the company is planning to issue to each employe an insurance policy of $1,000 and an old pension.

Factory of A. C. Knapp Co. Enlarged—The A. C. Knapp Co., motor car body makers, trimmers and painters, has recently completed additions to its plant on Mt. Elliott, at Detroit, Mich., which give it a total of 100,000 square feet of floor space, not including the buildings of the old Benham Mfg. Co., and of the Eby Auto Parts Co. A great extension of the company's business has taken place.

Motor Men Form County Association—The Stark County Automobile Trades Association, Stark County, O., was organized recently at Canton, O., with approximately 35 members.

Accessory Jobbers' Spring Meeting—The spring meeting of the National Association of Automobile Accessory Jobbers will be held at the Homestead, Hot Springs, Va., May 9 to 12. A large number of applications for membership have been received since the January meeting was held.

Farm Tractor Firm Organizes—Daniel Trench, Hoopeston, Ill., and A. W. Porter, Davenport, Ia., have organized a company for the manufacture of a new model of gasoline farm tractor and will open a plant in Hoopeston. The company hopes to commence operations the latter part of April.

Extending Willys-Overland Service—The Willys-Overland, Inc., distributor of the Overland and Willys Knight cars, is planning to build a large service station at Cleveland, O., in the west end of the city, and probably another in the east end. The company has five other stations at different places in the city. The company is making expenditures in building and service stations here that will approach $50,000.

Extra Dividend by Vacuum Oil Co.—The Vacuum Oil Co., New York City, has declared an extra dividend of 2 per cent as well as the usual semi-annual payment of 3 per cent, payable May 15 to stockholders of record May 1. The annual statement showed that net earnings in 1915 had been equal to more than 40 per cent on the $15,000,000 outstanding shares. The income account shows net profits of $6,861,913 against $2,075,644 in 1914.

Pelton Steel Co. Incorporates—The Pelton Steel Co. has been organized at Milwaukee, Wis., and incorporated with capital stock of $100,000. The company has taken over a crucible plant at Chicago avenue and Elliott place, on the main line of the Chicago, Milwaukee & St. Paul Railway. An electric furnace with 250 tons' capacity will be put into operation about June 1, and at present there are nine crucible furnaces working. A few orders have been received lately from motor car manufacturers at Detroit, Mich. E. T. Pelton, who was with the National Steel Foundries for 12 years, is general manager of the company.

Boston Quarters for Burd Sales Department—Burd High Compression Ring Co., Rockford, Ill., has opened sales offices at 899 Boylston St., Boston, Mass., with E. B. Allen as manager.

Watrous Leaves Woods Mobilette—R. E. Watrous has resigned as sales manager of the Woods Mobilette Co., and the Sheridan Commercial Car Co., Chicago. He has not definitely decided on future connections.

New Store for Stewart-Warner at Detroit—A building is being erected on Woodward avenue, Detroit, Mich., near the present quarters of the Stewart-Warner Speedometer Corp., the main floor of which will be used for salesrooms by that company.

Implement Man Joins Oakland Force—Z. S. Zertner, for several years well known in the farm implement manufacturing circles, has recently taken charge of the Philadelphia, Pa., branch of the Oakland Motor Co. He succeeds T. S. Johnson, who resigned to take up other work.

B. J. Goldie Becomes Factory Manager—B. J. Goldie became factory manager of the Columbia Axle Co., Cleveland O., on April 1. For the last 2 years Mr. Goldie has been the works manager of the Metal Products Co.-Timken-Detroit axle. For 5 years previous to his association with the Metal Products Co., Mr. Goldie was with the Chalmers Motor Co., and has been engaged in the motor car manufacturing business for a period of 10 years.

Master Carbureter Makes Appointments—The Master Carbureter Corp., Detroit, Mich., has appointed George P. Valerius, district manager for California, Utah, Wyoming and Montana. He was formerly a district manager for the Maxwell Motor Co. T. L. Grabe, who was formerly agent for the Autocar in Philadelphia, and later on the Pacific Coast, has been appointed factory representative for the Master corporation for the states of Michigan, Ohio and Indiana.

Recent Incorporations

Binghamton, N. Y.—Spawn-Phillips Motor Car Co., to deal in motor cars, motors, etc.; capital stock, $30,000; incorporators, P. E. Spawn, C. J. Phillips, F. S. Woosters.

Buffalo, N. Y.—Tourist Garage, to manufacture motors, engines, supplies, etc.; capital stock, $35,000; incorporators, C. L. Davis, E. L. Falk, E. C. Schlenker.

Canton, O.—Young Auto Supply Co.; capital stock, $20,000; incorporators, G. A. Young, H. E. Young, C. N. Young, W. S. Shester and J. K. McIlwain.

Camden, N. J.—Pezzetti Corp., to manufacture motor cars, trucks, etc.; capital stock, $125,000.

Chicago—Dean Turbo Motor Co.; capital stock, $2,500; incorporators, R. L. Dean, B. P. Gale, E. O. Hostetter.

Chicago—Dexter Garage Co., to conduct a garage; capital stock, $10,000; incorporators, E. J. Fleming, J. C. Dexter and H. A. Berger.

Chicago—Auto Starter Co.; capital stock, $2,500; incorporators, W. F. Millar, J. W. Diephouse and R. B. McKinney.

Cleveland, O.—Cleveland Glide Motor Car Co.; capital stock, $10,000; incorporators, Elmer K. Reymer, E. K. Reymer, Ida E. Ermerkin, H. E. Emerich, A. W. Emerich.

Corbin, Ky.—Corbin Auto & Delivery Co.; capital stock, $1,000; incorporators, W. H. Chandler, Q. A. Miles and R. O. Williams.

Dover, Del.—Bourne Magnetic Truck Co., to manufacture and deal in motors, engines, etc.; capital stock, $2,000,000; incorporators, H. E. Latter, E. P. Coffin and G. M. Egner.

Elizabeth, N. J.—Elizabeth Auto Sales Agency, general motor car business; capital stock, $50,000.

Findlay, O.—Economy Motor Co.; capital stock, $25,000; incorporators, R. W. Miller, J. A. Manecke, F. R. Miller, Carl Ehrhordt and George E. Schroth.

El Paso, Tex.—Tryon Motor Co.; capital stock, $5,000; incorporators, C. T. Tryon, H. C. Schwantes, W. E. Good.

Evanston, Ill.—L. J. Sherland Co., to manufacture and deal in motor vehicles and accessories; capital stock, $2,500; incorporators, L. J. Sherland, C. J. Anderson and R. E. Gentzel.

Laporte, Ind.—Aerothrust Engine Co.; capital stock, $100,000; incorporators, George L. Creek, R. T. Izer and A. J. Stahl.

Milwaukee, Wis.—Milwaukee Shaper & Transmission Appliance Co.; capital stock, $75,000; incorporators, A. J. Schmitz, Robert Wild and E. J. Gross.

Milwaukee, Wis.—Pelton Steel Co.; capital stock, $100,000; incorporators, E. T. Pelton.

Mt. Vernon, Ind.—Lichtenberger Sales Co., motor cars; capital stock, $6,500; incorporators, John O. Sprowl, J. Arch Sprowl and E. S. Lichtenberger.

New York—Millbury Rubber Goods Co., to manufacture tire and other rubber goods; capital stock, $50,000; incorporators, E. E. Beardon, E. J. Rathers, I. V. Williams.

New York—Morton W. Smith Co., motor cars, trucks and accessories; capital stock, $50,000; incorporators, W. W. Smith, C. F. Case, E. S. Lewis.

New York—St. Ray Forge & Co., to manufacture tires, rubber goods, accessories, etc.; capital stock, $100,000; incorporators, A. T. Maurice, P. B. Harringer, S. Kaitman.

Kansas City, Mo.—Pioneer Auto Supply Co.; capital stock, $60,000; incorporators, J. F. Nor-

New Albany, Ind.—Gwin Motor Sales Co., motor car repair; capital stock, $5,000; incorporators, C. B. Gwin, Lowland Gwin and H. W. Gwindyke, R. Helburg and N. T. Haynes.

New York—Lakeside Motor Truck Attachment Co.; to manufacture motor trucks, farm tractors and implements of all kinds; capital stock, $30,000.

Oshkosh, Wis.—Thom Automobile Co.; capital stock, $25,000; incorporators, A. H. Thom, H. W. Thom and K. L. Thom.

Oshkosh, Wis.—Universal Foundry Co.; capital stock, $10,000; incorporators, L. J. Monahan, J. D. Termaat and A. C. Ziebell.

Portsmouth, O.—Enterprise Garage Co.; capital stock, $5,000; incorporator, H. Hildenbiddle et al.

Rockford, Ill.—Modern Power Appliance Co., to manufacture and deal in motor cars, storage batteries and other supplies; capital stock, $5,000; incorporators, S. G. Smith, H. H. Rogers and W. D. Knight.

St. Louis, Mo.—Fred Campbell Auto Supply Co., to deal in motor cars and supplies; capital stock, $125,000; incorporators, Fred Campbell, W. R. Comstock, W. L. Ferrier, Jr., S. W. Campbell, D. K. Campbell.

St. Cloud, Minn.—McCadden Machine Works; capital stock, $50,000.

Springfield, Ill.—Cadillac Auto Co.; capital stock, $2,000; incorporators, M. O. Travis, A. C. Field and H. L. Fulmar.

Toronto, Ont.—Commercial Motor Bodies & Carriages, Ltd.; capital stock, $40,000.

Toronto, Ont.—Acme Tire & Rubber Co.; capital stock, $400,000; incorporators, J. M. Bullen, H. L. Steele, P. H. Hurley.

Tacoma, Wash.—Commercial Auto Co.; capital stock, $2,000; incorporators, J. H. Cole and V. C. Decker.

Tiffin, O.—Economy Motor Co., to deal in motor cars and accessories; capital stock, $25,000; incorporators, R. W. Miller, J. A. Maenecke, P. R. Miller, Carl Erhart, G. E. Schroth.

Toronto, Can.—Beemer & Co., to manufacture motor cars, motors, engines, etc.; capital stock, $55,000; incorporators, J. C. Beemers, F. D. McLachlin.

Trenton, N. J.—Seashore Service Co.; capital stock, $50,000; incorporators, P. J. O'Neill, A. A. Stevens, M. Weintrob.

Wheeling, W. Va.—Ohio Valley Automobile Club; capital stock, $5,000; incorporators, J. W. Spiedel, A. Langhan, A. B. Hoblitzel, H. L. Eckhart, H. W. Gee.

Winsted, Conn.—Winsted Garage Co.; capital stock, $10,000; incorporators, R. E. Alvord, H. V. Johnson, A. L. Johnson.

Youngstown, O.—Hazel Street Aut-Supply Co., to deal in motor car supplies; capital stock, $5,000; incorporators, B. G. Sackett, L. E. Walcutt, Louis Garlach and J. E. Palmer.